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CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

Special Editorial Correspondence, by Telegraph, Respecting the Fourth Annual Meeting of the Pacific Coast Gas Association... 121

Briefly Told 122

The Jones Testimonial Album—Notes.

*Improvements at East Greenwich—Tunneled Retort Benches. 123

*Shelton's Gas Generator..... 123

*The Norris System of Carbureting Water Gas..... 125

Coke Production in 1895..... 127

*Anti-Vibratory Fitting for Incandescent Lamps..... 129

The Use of High Voltage Lamps, by Mr. W. N. Stewart..... 130

The Temperature of Certain Flames..... 130

Special English Correspondence..... 131

Some Properties of Acetylene—Tunneled Retort Benches—What is 20-Candle Power Gas.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 133

Contracts for Mr. Weber—Cheaper Gas for Bridgeport, Conn.—The Massachusetts Pipe Line Gas Company Organized—Death of Mr. Joseph Barker—Annual Meeting, Stillwater, Minn.—The Pintsch Plant at Easton, Pa., Completed—Storage Holder, Portsmouth, Ohio—Annual Meeting, Shelbyville, Ind.—The Hearing on the Millbury (Mass.) Case—Franchise of the Sedalia (Mo.) Company Renewed—Annual Meeting, Peoples Company, Rutland, Vt.—Annual Meeting, Newton and Watertown, Mass.—Annual Meeting, Consolidated Company, Baltimore—Taxing Gas Mains, East Newark, N. J.—Death of Mr. John W. Lanehart—Annual Meeting, Milford, Mass.—Cheaper Gas for Chelsea, Mass.—The New Public Loan for Philadelphia Passed—And Other Items.

Influence of Acetylene on Coal Consumption..... 135

The Market for Gas Securities..... 135

[Special Editorial Correspondence, by Telegraph.]

THE FOURTH ANNUAL MEETING OF THE PACIFIC COAST GAS ASSOCIATION.

SAN FRANCISCO, CAL., July 23, 1896.

Dear JOURNAL: The fourth annual meeting of the Pacific Coast Gas Association is at an end, and a glance over the records thereof shows that its work was well done, and that the field of its future usefulness is broadening. The weather conditions were perfect, for brighter days and balmier airs were not to be recalled to memory; and this is saying much to those who have enjoyed the glories of a typical California July atmosphere. The attendance was large, representative and enthusiastic, and the papers, which were well written and on topics of live and abiding interest, brought out discussions no less useful and valuable than the lines that evoked them. Recurring again to the matter of attendance, the presence of many from a distance was noteworthy. Of course, it goes without saying that the officers were quite up to the mark, both in the matter of knowing how to keep firm control of the proceedings, without causing the same to become mere routine because of adherence to set rulings of conventional procedure, and in offering at the right time those simple hints that are so effectual in keeping "the ball of conversation" rolling along smoothly. President "Ed." C. Jones, indeed, proved himself a past master in the art of directing, and Secretary John A. Britton was always alert and ready to keep up the good work from the Secretary's desk. The inaugural message of President Jones was received with much favor. It was largely devoted to a consideration of the past and prospective of the gas interests of the Pacific Slope, with a very interesting reference to and speculation upon the wonderful development there of the oil industry. The address did not leave anything to be desired regarding his belief in the stability and growth of the Coast gas industry, which belief is all the more significant when one recalls to mind the fact that it is but a question of short time when the fortunes of the Company which he serves so faithfully and successfully (the San Francisco Gas Light Company) and those of the San Francisco Edison Light and Power Company will be practically united. However, the gas men of the East as well as those of the Coast know that "Ed." is not only a firm believer in gas, but also founds his belief on careful examination and logical conclusion—a practice that excludes sentimentalism, with its quicksands of inflated hope and blinding desire. A very fraternal incident of the meeting was the presentation to President Jones of a handsome album, containing an illuminated, engrossed set of resolutions, with striking panel pictures of Messrs. Crockett, Quilty and the recipient, and many photographs of others of the members. The album is a marvellous specimen of artistic binding, illumination and engrossing. On receiving the souvenir, the genial "Ed." was quite taken aback, but his Eastern nerve speedily reasserted itself, and his speech of acceptance and recognition was almost eloquent enough to have secured for him a nomination for office on any platform that he saw fit to plank.

The papers were, as said before, of a high order, and perhaps the one which commanded the greatest attention was that submitted by Mr. J. B. Grimwood, of San Francisco, on the subject of "Oil Tar and its Uses." The whole list of papers, together with the detail of "Exper-

iences," as edited by Mr. John Clement, the "Wrinkle" series, as put in form by Mr. Parker, and the Question Box, formed a technical programme that puts the Pacific Coast Gas Association in the very first rank as providers of material that is instructive, valuable and entertaining to the "men who make gas." Exhibitions were given of the value and utility of the Roentgen shadowgraphs, and of the beauty of illumination afforded by the combustion of acetylene. The gas was generated in and consumed through specially prepared fixtures in full view of the audience, and the exposition was in all respects successful. The general opinion, however, seems to be that the cost of the lighting obtained from the combustion of acetylene gas puts it out of court just now as an aid to the gas maker. The headquarters and place of meeting left nothing to be wished for on the score of facility and completeness. The membership list was increased by the placing thereon of 11 names—making a total now on the roll of 102; and the actual number in attendance was 52. The officers elected were:

President—T. R. Parker, Napa City, Cal.

Vice-President—F. H. Eichbaum, San Francisco, Cal.

Secretary and Treasurer—John A. Britton, Oakland, Cal.

Directors—M. C. Osborne, L. P. St. Clair, R. M. Powers and John Clements.

Mr. M. C. Osborne will edit the "Wrinkle" department for the ensuing year, and the "Experience" recount will be under the direction of Mr. John Clement. The latter's management this year of the initial "Experience" recital was eminently successful. The banquet at the Palace Hotel was absolutely flawless, no matter from what point of view one looked on it. Mr. Jones presided with dignity and tact, and the duties of toastmaster were carried out in inimitable style by ex-President Joseph B. Crockett. In fact, the President of the San Francisco Gas Light Company seems to be in training to wrest from your (and our, too), Captain White the laurels awarded him for the successful wielding of the gavel that sways the banqueting course. An excursion across the Golden Gate to Marin, with its grand scenery, fertile valleys and golden fruit, with its rugged hills, crowned by the overtopping heights of Tam el Pais, fitly closed the very successful fourth annual session of the Pacific Coast Gas Association.—B.

BRIEFLY TOLD.

THE JONES' TESTIMONIAL ALBUM.—Our correspondent "B.," in his telegraphic mention above, respecting the Fourth Annual Meeting of the Pacific Coast Gas Association, alludes to a testimonial, presented to the retiring President, Mr. E. C. Jones, by the members, as a mark of the regard in which they hold him. The album is 14 inches by 17 inches, with 25 leaves between its covers, capable of retaining 3 full size panel and 196 cabinet pictures. The binding, which is really a beautiful example of what book preservers can accomplish, is in full, genuine dark blue seal, lined (front, back and fly-leaves) with white watered silk. On the cover, in a sunken panel, is a reproduction, in solid silver, of the badge of the Pacific Coast Gas Association. The outer rim, representing a circle in pipe, is oxidized; the flame issuing from the burner in the center of the emblem is in gold, and the balance is in bright finish. The book is closed by two heavy sterling silver clasps, one of which carries an engraving, in *fac simile*, of Mr. Jones' signature; the other clasp bears the date of the term of his Presidency of the Association—1895–1896. The interior of the book is decorated, first, by a set of beautifully engrossed and illuminated resolutions, respecting that which the Association "thinks" of Mr. Jones; second, by panel pictures of Mr. Joseph B. Crockett, of Mr. C. W. Quilty, and of the recipient; then follow cabinet pictures of the other members of the Association, arranged alphabetically. The entire work is one of great beauty and reflects merit upon the recipient and credit upon those who conceived and completed it.

NOTES.—At the annual meeting of the San Francisco Edison Light and Power Company the terms of the proposed consolidation between it and the San Francisco Gas Light Company were formally ratified. ——Mr. Forrest E. Barker, Chairman of the Board of Gas and Electric Light Commissioners, of Massachusetts, sailed last Saturday, on the Spaarndam, of the Netherlands line, for a short European trip. He is booked to return on the steamer Patria, of the Hamburg-American, leaving for New York, August 30th.——Other prominent gas men now "tripping" it in Europe are: E. H. McCullough, M. S. Greenough (he's been abroad before) and A. C. Humphreys.——The Berlin Iron Bridge Company, of East Berlin, Conn., will construct the roof of the new power house for the Amherst (Mass.) Gas and Electric Light Company.

[From the *Journal of Gas Lighting.*]

Improvements at East Greenwich—Tunnelled Retort Benches.

The East Greenwich station of the South Metropolitan Gas Company is one of the points for which the gas engineering pilgrim visiting London has learnt to make, not merely for the satisfaction of a legitimate curiosity to see the "largest gasholder in the world"—for this may be gratified without taking the trouble to go very near the site of the works—but because the scheme of the station in the general, as well as in detail, is a lesson in thrifty design and efficient management. It is some time since we had a particular call to inspect the East Greenwich works, but in the course of last week attention was directed again to a not very astonishing patent notice that appeared in the *Journal* for May 5 last, in which Mr. M. J. Joyce claimed protection for an improvement in carbonizing plant consisting of a "combination with gas or other retorts of a tunnel or alley with openings from the sides thereof to the ashpits and furnaces, and arranged so that the furnace bars can be clinkered, and the furnaces and ashpits cleared, without the operators being exposed to danger from coke, tar, or the like, falling from the retorts." We were informed that this modest patent, which might easily

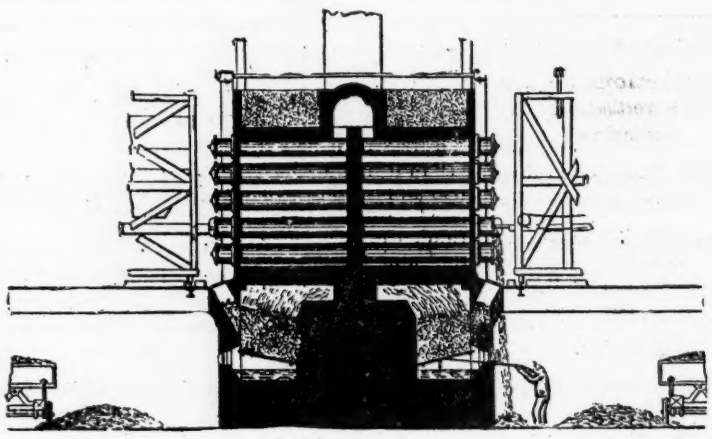


Fig. 1.

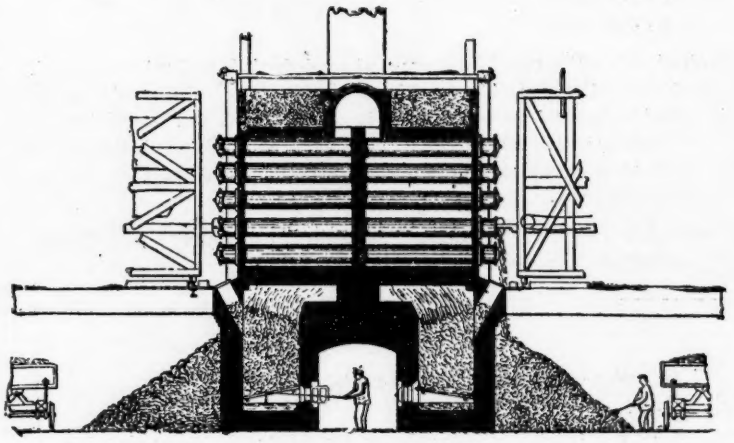


Fig. 2.

have been overlooked by the most diligent searcher after meritorious novelties in gas engineering construction, really covered an improvement of vast economical possibilities, and that a realization of it was to be seen, by permission of Mr. J. Tysoe, the Resident Engineer at East Greenwich. So without unnecessary delay we went to see it. One of the accompanying illustrations shows what it is that Mr. Joyce has patented—and that has been on view, be it said, at East Greenwich for several years past in a more or less perfect shape.

The first figure represents a transverse section through a stage retort house of modern proportions, with settings of tens worked by machinery, and heated by pairs of gas generator furnaces (not regenerators) having an overhead main flue. There is nothing remarkable about this design. The furnaces are worked from the face of the bench, the fireman having to share the coke floor with the falling coke, and the latter needing to be cleared out of his way, and loaded into the trucks which appear in the background. The next illustration exhibits the Joyce improvement in operation. There is the same retort bench, with the difference that a tunnel has been pierced through what the French would call the *massif* of the bench; and the clinkering doors of the

generator furnaces open into this tunnel instead of into the coke floor. A slight modification, on the face of it; but nevertheless one that carries several undeniable practical advantages worthy of particular attention in a large works. In the first place, the firemen are able to work in complete security from the risk of injury by falling substances which is inseparable from the usual arrangement; they have their work more conveniently under their hand; and they are in consequence able to attend to a larger number of furnaces. The tunnel is not at all hot or stuffy to work in, with the system of firing practiced at East Greenwich, although this involves a pair of furnaces to every setting, the clinkering doors being directly opposite one another. Next, the capacity of the coke floor for holding coke is practically doubled with the new arrangement, by which the coke can remain piled up against the face of the bench, and is only handled once in putting into the trucks. The nature of the change will be understood from a glance at the two sections. At East Greenwich, the saving of wages from this source alone amounts in positive figures to 12s. per week per bench, and there is a corresponding economy in a reduction of the quantity of breeze made. The pan ashes and clinkers, moreover, cannot get mixed with the coke, and there are other minor, but real, advantages attendant upon the physical separation of the firemen from the "cokeys"—each class of workmen having their own subterranean region to themselves.

It will be noticed that several concurrent conditions must exist to render the realization of such an arrangement possible. At East Greenwich, the commencement was made by the provision of the axial tunnel, which simply took the place of the underground main flue, which belongs to the regenerative system of retort firing. This system was not successful at this station—possibly through the settling of the retort benches in the early days, which demoralized the air and spent gas flues. At any rate, for whatever reason, the regenerative settings were altered, greatly to the relief of the management, to simple generators with an overhead main flue. This dispensed with the underground main flue, and Mr. Tysoe accordingly had the idea of enlarging the opening and making a tunnel of it, partly with the object of lightening the weight of the bench upon the compressible subsoil. Contrary to what might have been expected, the tunnel so constructed was not at all a sultry place, and this fact suggested the after-thought of making the furnace clinkering doors open into it. As things have turned out, the idea has proved fruitful of considerable economy; but precisely how much "invention" there may be in it, is not for us to state. It will be news to us if anybody can patent a tunnel through a retort bench—such tunnel, moreover, being made by somebody else, in substitution for a superseded main flue, and there is no invention in putting a clinkering door on one side of a furnace instead of another. There may be, and undoubtedly are, many real inventions which do not possess the economical advantages of a re-arrangement and adaptation of common structural elements such as we have been describing. But economical advantage alone does not constitute invention; and if any gas manager possessing the requisite facilities were to-morrow to copy the East Greenwich retort house improvement, on his own risk, it is difficult to see on what grounds anybody could stop him.

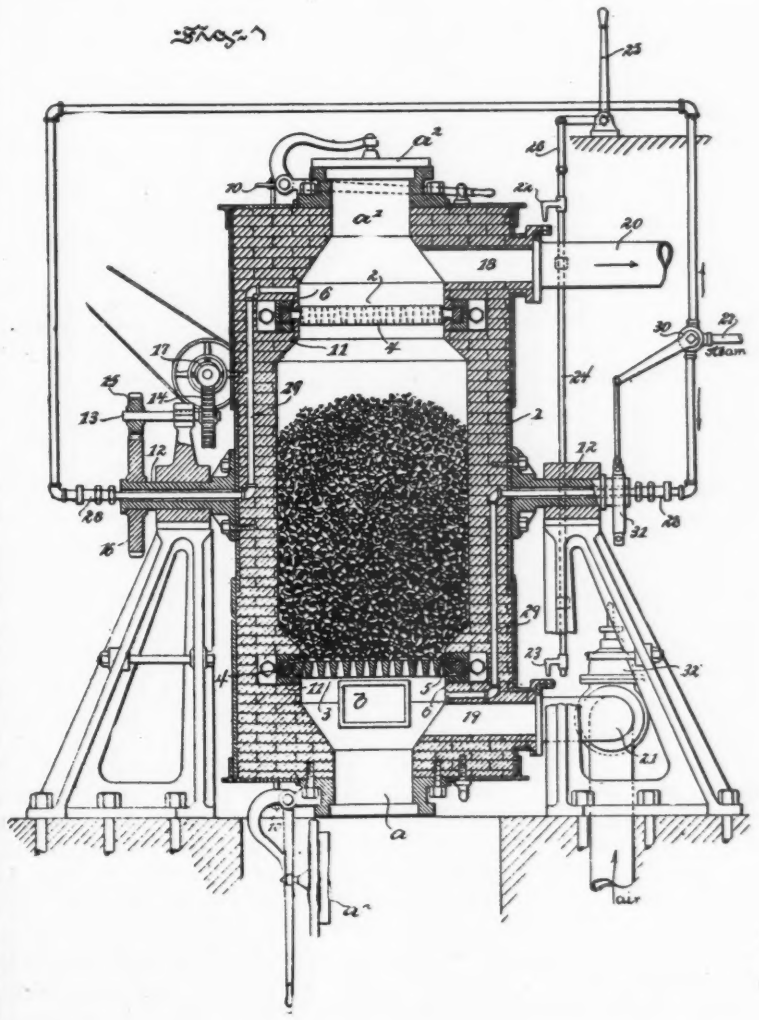
The East Greenwich carbonizing plant is worth inspecting on other accounts than that of the converted main flue. The standard setting is tens, in pairs; and these retorts are worked very conveniently by machinery. Mr. Tysoe prefers 21 in. by 15½ in. ⏢ retorts as most suitable for the latter purpose; a comparatively deep retort being easier for the mechanical rake to negotiate. He has had no trouble with stopped ascension-pipes, since he insisted on the use by the stokers of a large auger, just half-an-inch less in diameter than the inside of the 6-inch pipe. Formerly, under the rules of the Union, the stokers considered their duty done if they got a hole of any size pricked through the pipe; and in those days the retirement of a stoking gang to their lobby was the signal for the appearance on the stage of an army of pipe-jumpers, who slacked off the lids that had just been closed, and proceeded at their leisure to clear the pipes in their own fashion—the gas meanwhile flaring away in futile testimony to the excellence of the heats. Now all this is changed. The pipes have to be properly cleared before the stokers go on with their work; and if a pipe stops up the men have to come back and put it right. This is the result of the use of a full-sized auger, under the supervision of a foreman who knows that he will be held responsible for the state of the pipes. Moderate heats, of course, are another feature of the working. A make of about 6,250 cubic feet of gas per mouthpiece, from Durham coal, yielding about 10,250 cubic feet per ton; simple generator furnaces clinkered every 24 hours; retorts kept at work for above 1,500 days—these are the non-heroic, but reliable standards of carbonizing worked to at East Greenwich. It is not a record-breaking style of carbonizing; but the manager of a large works learns from experience to be content with mediocrity in all matters which must be left under a division of responsibility.

Mr. Tysoe sets his retorts with a camber of about 4 inches in the middle; this allows for subsidence; and if there should be no sinking, the slope favors the drawing without interfering with the charging. He uses very largely the modification of the self-sealing lid invented by himself and another—Tysoe and Mitchell's patent—which has many points to recommend it, especially for machine-worked retorts. The pressure of the fastening is brought upon the lid at two points, where it can be readily adjusted; the weight of the lid is more perfectly carried; the fastening is more effective and out of the way, and there is facility for slacking off the lids and firing without causing the objectionable "rap." The great recommendation of the improvement for machine stoking is the clear-way it affords along the front of the settings—there being no handles to stick out or be banged into place with a rod at the imminent risk of breakage, while for all retorts and furnace doors the adjustability of the lids, and ease of fastening them tight, are bringing the system into extended use. Altogether there is a good deal to be noted and pondered over in the carbonizing and other departments of the East Greenwich works of the South Metropolitan Gas Company, which appear to be developing very satisfactorily on the lines laid down by Mr. George Livesey.

Shelton's Gas Generator.

On July 7th U. S. Letters Patent (No. 563,328) were granted to Mr. Frederick H. Shelton, of Philadelphia, for improvements in gas generators. Using the words of the specification:

The principal object of my present invention is to reduce the consumption of fuel by promoting combustion, by obviating caking of the fire, by preventing the existence of a comparatively cool or dead layer



of fuel at the base of the generator, and by enhancing the facilities for removing clinker.

To those ends my invention comprises the improvements hereinafter described and claimed.

The nature, characteristic features and scope of my invention will be more fully understood from the following description, taken in con-

nection with the accompanying drawings, forming part hereof, in which

Figure 1 is a central sectional view of apparatus embodying features of my invention. Fig. 2 is a side elevational view of the same. Fig. 3 is a sectional view showing a plan of one of the grates illustrated in Fig. 1. Fig. 4 is an elevational view of a portion of the apparatus illustrated in Fig. 3, and Fig. 5 is a view illustrative of the mode of operation of apparatus embodying features of my invention.

For the sake of description I have shown my invention in application to a generator adapted for use in connection with apparatus of the Lowe type for producing water gas, but it is applicable to other types of gas producing apparatus.

Fig. 2

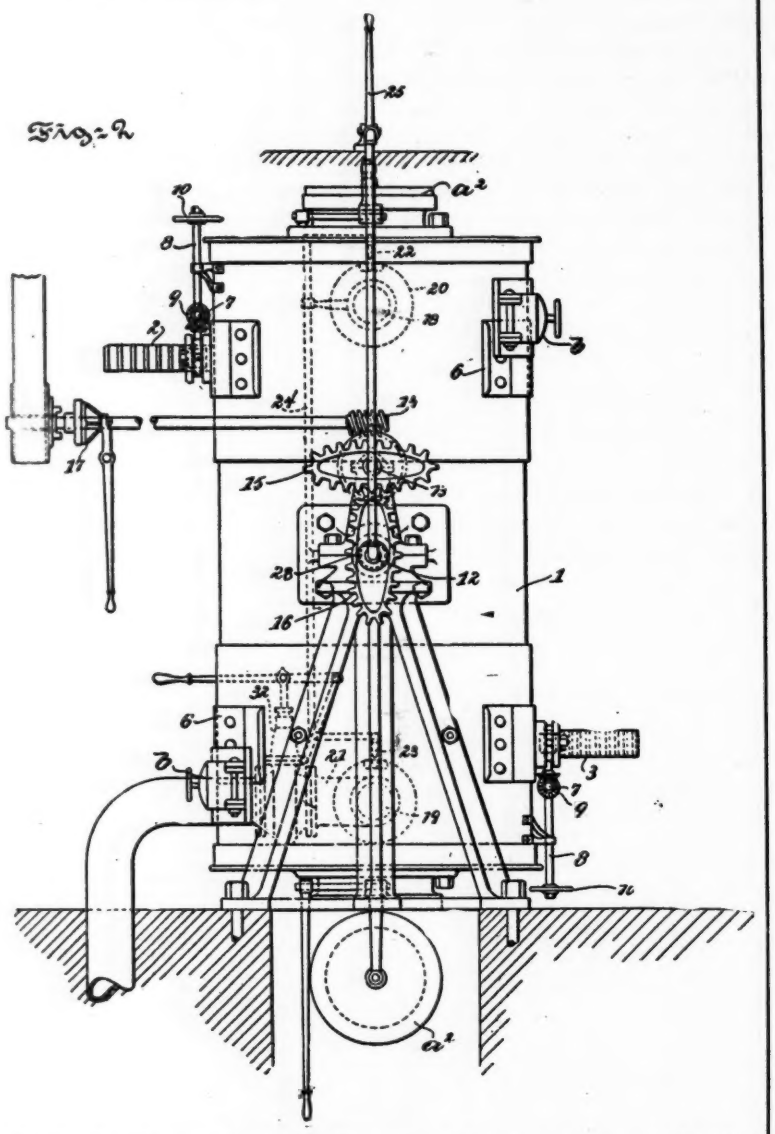


Fig. 3

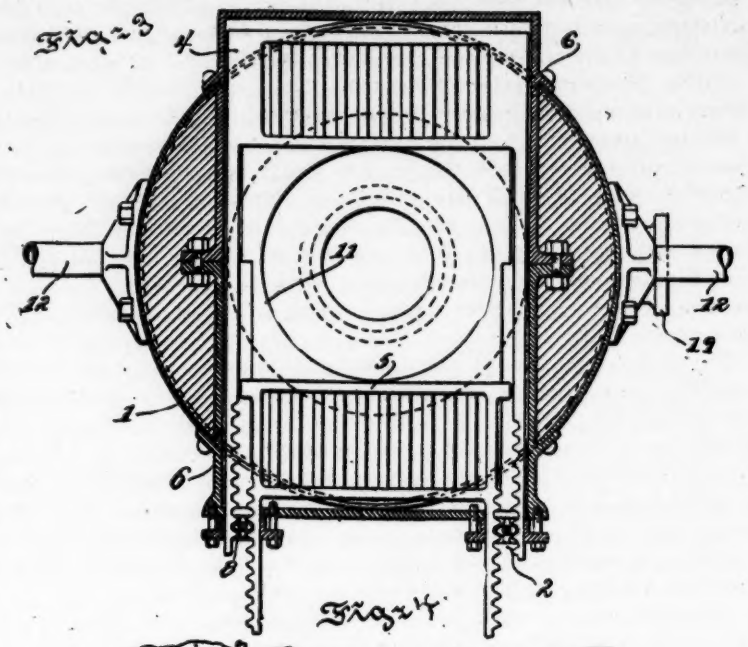


Fig. 4

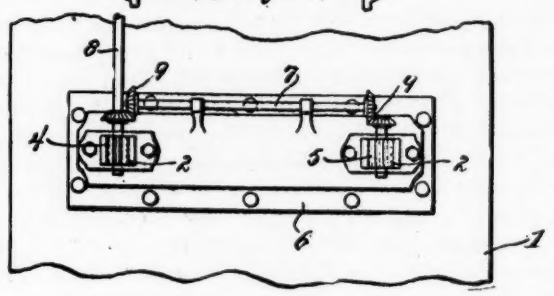
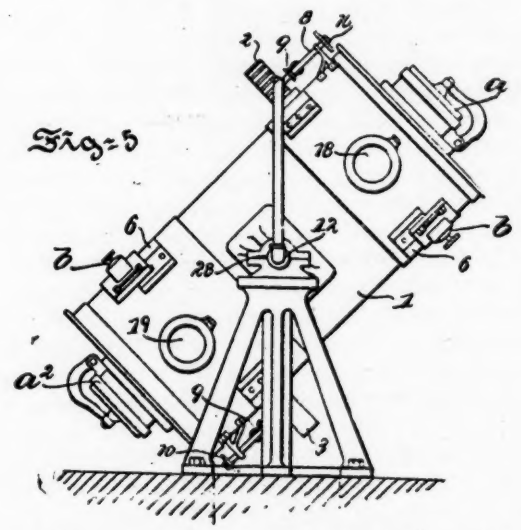


Fig. 5



In the drawings, 1 is a pivotally surported generator or combustion chamber which may be turned upside down for the purpose of pouring the fire and thus breaking up cakes of fuel and presenting the same in new relations, whereby combustion is materially promoted and the formation of comparatively hot and cold layers is prevented. 2 and 3 are movable grates disposed above and below the fire and adapted to be brought into operative and inoperative positions. Referring to Figs. 3 and 4, each of these grates comprises two parts or sections 4 and 5, adapted to slide in suitable ways which may be formed in or upon a casting 6, that is built into or otherwise connected with the generator 1. As shown, these grate sections are provided with racks with which suitable pinions mesh. These pinions in turn may be operated through the intervention of shafts 7 and 8, bevel gears 9, and hand wheels 10. The interior walls of the generator 1 may be contracted or boshed, as at 11, in order to afford spaces for the accommodation of the grate sections in such manner that when drawn into inoperative position they are not unduly exposed to the heat of the fire. The respective ends of the generator are provided with suitable openings, as a and a^1, adapted to discharge into the ashpit, and with means, as clapper valves a^2, for closing them. The opening a or a^1, which is at the top, is useful for charging in fuel and for permitting the removal of clinker from the walls adjacent to that end of the generator. I may also provide doors, as b, which are useful when the generator is not operated by turning it upside down, and at other times if required.

To turn the generator upside down, one of its trunnions 12 may be provided with a gear wheel to which power is applied.

For the sake of a description of what I believe to be the best embodiment of my invention, I have shown a countershaft 13, to which power is applied by means of a suitably driven worm 14, and which is provided with an elliptical gear wheel 15, that meshes with an elliptical gear wheel 16, and I have also shown a clutch 17 for controlling the operation of these parts. The elliptical gear wheels present advantages in that motion is transmitted by them slowly to the trunnion in starting and more rapidly thereafter, whereby safety and economy in the application of power to the movement of a heavy generator are insured.

The generator may be provided with twin openings 18 and 19, adapted to come into alignment with an outlet pipe 20, for example, for gas, and an inlet pipe 21, for example, for air.

In the embodiment of my invention illustrated in the drawings I have shown coupling devices, as wedges 22 and 23, adapted to penetrate openings in ears or lugs connected, respectively, with the generator and with the pipes 20 and 21, so that these wedges afford means for coupling and uncoupling the generator and pipes to prevent leakage or movement during gas making. Moreover, these wedges are shown in connection with a rod 24, which may be shifted through the intervention of a hand lever 25 and link 26. If desired, communication may be had with the interior of the generator by way of its trunnions. In the drawings I have shown a pipe 27, that may be used for establishing

such communication for the introduction of steam. This pipe 27 is branched, and each branch is provided with a stuffing box and swivel pipe joint 28. From the stuffing box tubes, pipes or ducts 29 extend through the walls of the generator or otherwise to appropriate points of discharge, for example, to points outside of the grates. If desired, I may provide a 3-way cock 30 for directing communication from the pipe 27 by way of either of its branches. This valve 30 may be operated manually, or its lever may be connected with the strap of an eccentric 31, which moves with the generator, so that when the generator is turned upside down communication is automatically established from the pipe 27 by way of the branch and duct which leads to and discharges beneath the fire.

The mode of operation of apparatus embodying features of my invention may be described in connection with the accompanying drawings as follows: Air is introduced by way of the pipe 21 until the fire is brought to the required state of incandescence, whereupon the supply of air is shut off, for example, by means of the valve 32. Steam is then permitted to traverse the pipe 27, for example, by opening an appropriate valve (not shown), whereupon steam from this pipe 27 is directed by the valve 30 to the branch pipe that discharges beneath the fire. In this connection it may be stated that one of the grates underlies and supports the fire and that the other is in an inoperative position, as shown in Fig. 3, and is protected from the heat of the fire by the walls of the generator. Prior to the succeeding blast, or as soon as the fire has commenced to cake or has commenced to form disadvantageously into layers of different temperatures, the attendant in charge may shut off the steam and air and cause the generator to be turned upside down, as illustrated in Fig. 5. For this purpose he would operate the lever 25, so as to uncouple and subsequently couple the inlet and outlet fittings and shift the grate which was in inoperative position into operative position, and the grate which was in operative position into inoperative position, by means of the hand wheels 10, and would operate the clutch 17 for effecting the desired movement of the generator. Afterward he would proceed to operate the generator in its new position in any appropriate manner, for example, as above described. By turning the generator upside down at appropriate times economical combustion of the fuel and beneficial results in the production of gas are attained, because caking of fuel and the formation of comparatively cool layers at the bottom of the fire are avoided by the pouring action to which the fuel is subjected. The pouring action forms, compared with the present old style of stationary generator, a fresh and increased mixture of the hot or live fuel with the cooler or dead fuel, thus promoting fresh combustion. In addition, by turning the generator upside down the comparatively live fuel at the top is brought to the bottom and beneath the comparatively dead portion, so that upon the next application of the blast this dead portion is in best position for rekindling.

It will be obvious to those skilled in the art to which my invention appertains that modifications may be made in details without departing from the spirit thereof. Hence I do not limit myself to the precise construction and arrangement of parts hereinabove set forth, and illustrated in the accompanying drawings; but the claims of the inventor are:

1. In combination, a generator, grates and means for introducing a blast at its top and bottom ends, and means for turning the generator upside down, substantially as described.

2. In combination, a gas generator provided with trunnions, bearings adapted to support said trunnions, means for turning the generator upside down, means for introducing a blast, and a grate near each end of the generator, substantially as described.

3. A pivotally supported gas generator, provided at or near its extremities with movable grates adapted to be shifted into operative and inoperative positions, substantially as described.

4. In combination a pivotally supported gas generator, provided near its top and bottom ends with openings and grates, means for turning the generator upside down, and pipe connections fixed in respect to the top and bottom ends of the generator and adapted to correspond with the openings at each end thereof, substantially as described.

5. In combination a gas generator, having an opening near its end, means for turning the gas generator upside down, a fixed pipe connection adapted to correspond with said opening, and devices for coupling and uncoupling the generator and pipe connection to permit of the generator's turning, substantially as described.

6. In combination, a pivotally supported generator, provided at or near its ends with inlet pipe connections, a valve for said pipe connections, and mechanism connected with the generator and operated by its turning to control said valve, substantially as described.

7. In combination, a pivotally supported generator provided at its ends with twin openings, and near its ends with movable grates, valves for said openings, and means for turning the generator upside down, substantially as described.

8. In combination, a pivotally supported generator, boshed and provided with recesses near its ends, and grates adapted to said recesses and protected by the boshed portions of the generator, substantially as described.

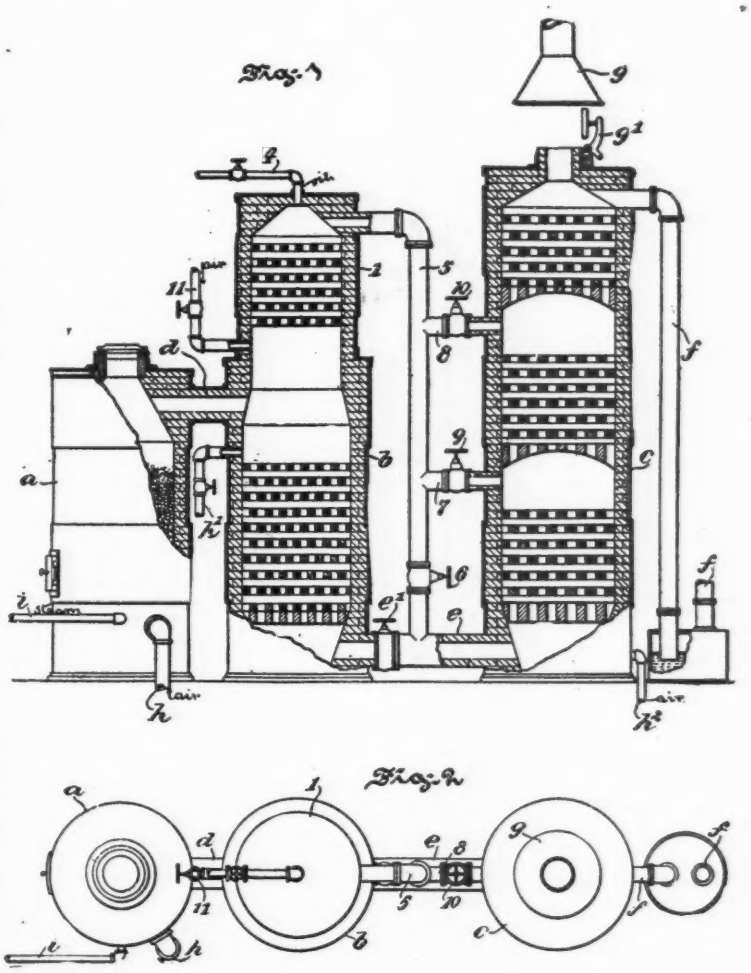
9. In combination, a generator having at its ends grates and blast connections for gas making, means for turning the generator, fixed pipe connections located near the top and bottom of the generator and adapted for co-operation with said blast connections and grates, and means for pivotally supporting the generator, substantially as described.

10. In combination, a pivotally supported generator, movable grates located at or near its ends and adapted to be shifted into operative and inoperative positions, and means for shifting said grates, substantially as described.

In combination, a pivotally supported generator, grates near each end of the generator, and pipe connections through its point of support to its grates, substantially as described.

The Norris System of Carbureting Water Gas.

On July 7th U. S. Letters Patent (No. 563,300) were granted to Mr. Rollin Norris, of Philadelphia, for improvements in methods and means of carbureting water gas—the inventor assigned all rights involved to



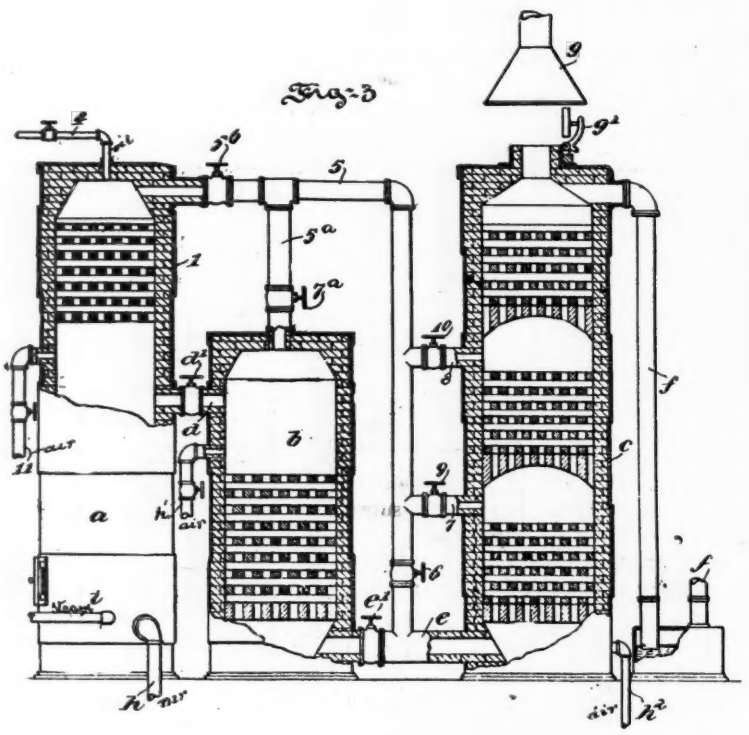
the United Gas Improvement Company. Using the words of the specification:

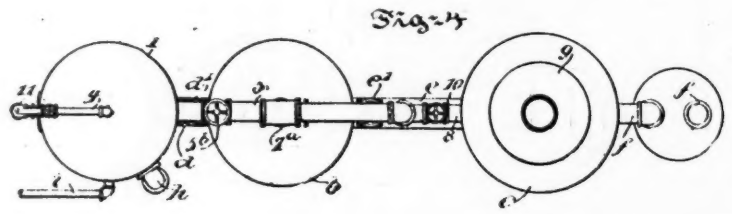
The principal object of my present invention is to subject oil to a rough fractional distillation and to subject the lighter vapors, after their admixture with the water gas, to a different and milder treatment than is given to the heavier portions after their admixture with the water gas for the purpose of economically and efficiently fixing the gaseous mixture or making the carbureted water gas; and to this end my invention consists of the improvements hereinafter described and claimed.

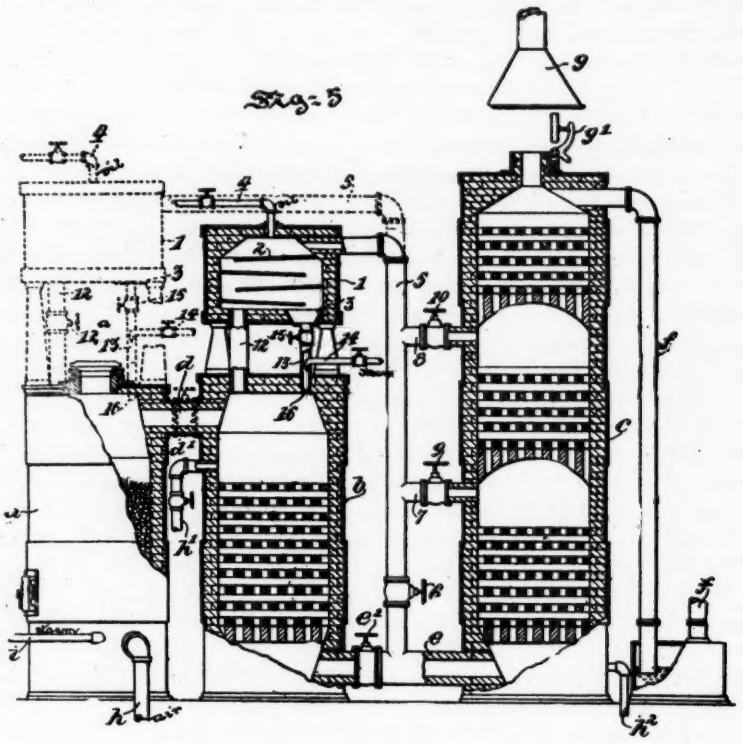
The nature, characteristic features and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part thereof, in which

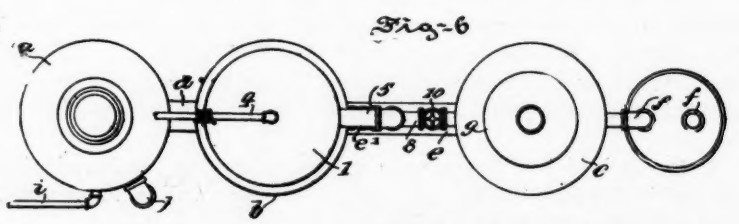
Figure 1 is an elevational view, partly in section, showing features of my invention in application to a well known type of apparatus for producing carbureted water gas. Fig. 2 is a top or plan view of Fig. 1. Fig. 3 is an elevational view, partly in section, showing a slightly different arrangement of the parts illustrated in Figs. 1 and 2. Fig. 4 is a top or plan view of Fig. 3. Fig. 5 is an elevational view, partly in section, illustrating a modification of my invention in application to a well known type of apparatus for producing water gas; and Fig. 6 is a top or plan view of Fig. 5.

In practicing my improved method of carbureting water gas the oil is subjected to a rough fractional distillation, and the current of water gas is divided and a portion of it mixes with the heavier products of the rough distillation and traverses a considerable extent of preheated chambers, and another portion of it licks up the lighter products of the fractional distillation and joins the first mentioned portion at various and different points in its travel through the preheated chambers. By this mode of procedure the water gas and oil vapors are satisfactorily fixed and the lighter oil vapors are subjected to a different and milder treatment than the heavier portions, whereby each portion of the oil is









subjected, in company with the water gas, to that degree of heat which is appropriate for the accomplishment of the best practical results, having reference to the quality and economy of production of the carbureted water gas.

Referring to the drawings, *a* is a generator, and *b* and *c* are fixing chambers provided, respectively, with suitable checkerwork of refractory material. *d* is a conduit by means of which the generator *a* may be caused to communicate with the fixing chamber *b*, and *e* is a conduit by means of which the fixing chamber *b* may be caused to communicate with the fixing chamber *c*. *f* is an eduction pipe for the carbureted water gas, and *g* is an offtake for the waste products. *h*, h^1 and h^2 are pipes for introducing air for the purpose of aiding combustion and in order to preheat the apparatus, the products of such combustion escaping at the offtake *g*. *i* is a pipe for introducing steam to the generator for the purpose of generating water gas, the gaseous products being first carbureted, as is hereinafter described, and then led off through the eduction pipe *f*, and preserved.

Having thus described certain parts of a well known type of apparatus for producing water gas, I will proceed with a description of my invention. 1 is an oil vaporizing chamber that may be internally supplied with checkerwork of suitable non-porous material, as shown in Figs. 1 and 3, or with inclined baffle plates 2, and a drip cup 3, as shown in Fig. 5. The oil vaporizing chamber 1 may be mounted above the fixing chamber *b*, as shown in Figs. 1 and 2, or it may be mounted upon the generator *a*, as indicated by dotted lines in Fig. 5 and as shown in Fig. 3. 4 is a pipe by means of which oil is admitted to the oil vaporizing chamber 1. 5 is a pipe communicating with the upper portion of the oil vaporizing chamber 1, and with the conduit *e*, that connects the fixing chambers *b* and *c*. This pipe 5 is provided with a valve 6, and with branches 7 and 8, having valves 9 and 10, and communicating with different portions of the fixing chamber *c*. Moreover, in Fig. 3 this pipe 5 is also provided with a branch 5a, having a valve 7a, and adapted to communicate with the fixing chamber *b*.

Referring to Figs. 1, 2, 3 and 4, the base of the vaporizing chamber is open and constitutes a passage and communicates directly with the interior of the fixing chamber *b*, Figs. 1 and 2, or with the interior of the generator *a*, Figs. 3 and 4, and is or may be provided with an air inlet pipe 11, for purposes to be hereinafter described.

Referring to Figs. 5 and 6, the base of the oil vaporizing chamber 1 and the drip cup 3 communicate by way of pipes or passages 12 and 13 with the interior of the fixing chamber *b*, as shown in full lines, or with the interior of the generator *a*, as indicated by dotted lines. 14 is a steam nozzle adapted to discharge into the pipe or passage 13 between its valve 15 and its contracted end 16, so that by opening or closing the valve 15 the quantity of the heavy portions of the oil sprayed by the steam jet from the cup 3 to the fixing chamber *b* may be regulated and controlled.

The mode of operation of the apparatus above referred to may be described as follows: Air is admitted to the generator by way of the pipe *h*, and the gaseous products are subjected to secondary combustion by means of air introduced by way of the pipes h^1 and h^2, in order to preheat the chambers *b* and *c* by internal combustion. If required, the oil vaporizer 1 (illustrated in Figs. 1 and 3) may also be preheated during the blow and before the admission of the oil by choking or partially closing the valve e^1, Fig. 1, or d^1, Fig. 3, and opening the valve 6, Fig. 1, or 5b and 7a, Fig. 3, in order to divert a portion of the blast gas into the oil vaporizer where it is burned by means of air introduced through the pipe 11. When the required parts of the apparatus have been sufficiently heated by internal combustion, the admission of air is interrupted, the valve g^1 is closed, oil is admitted by way of the pipe 4, and steam is admitted by way of the pipe *i*, so that water gas is generated in the generator *a*. It may be remarked that the valves 12a or 6, 9 and 10, Fig. 5, are closed during the blow. The water gas is divided and a por-

tion of it passes through and from the bottom to the top of the oil vaporizer 1, and another portion of it passes to and through the fixing chamber *b*, and thence to the conduit *e* and fixing chamber *c* to the eduction pipe *f*. This relative division of the water gas may be controlled so as to send more or less of it through the oil vaporizer by manipulating the valves e^1 and 6, 9 and 10, Fig. 1, or the valves d^1 and 5b, or e^1, 6, 9 and 10, Fig. 3, or e^1 and 6, 9 and 10 in both constructions, Fig. 5, or 12a and e^1 or 12a and d^1 in dotted line construction, Fig. 5. Some of the heat of the portion of the water gas that enters the vaporizer 1, in connection with heat stored in the vaporizer by optional internal combustion of part of the blast gases, causes the oil to be separated into light vapors and heavier products. The latter pass into the generator *a*, Fig. 3, and dotted construction, Fig. 5, or into the fixing chamber *b*, Fig. 1, and full-line construction, Fig. 5. Referring to the construction shown in Fig. 5, these heavier products pass over the baffle plates 2, and collect in the cup 3, from which they are drawn in regulated quantities by the steam jet 14, as has been already explained. In either case the heavier products join one of the divisions of the current of water gas comparatively near its point of generation and travel in its company through a comparatively large extent of preheated chambers, namely, the chambers *b* and *c*. The current of water gas that is by-passed through the vaporizer 1 licks up the lighter oil vapors and carries them off near the top of the vaporizer. This current of gas and lighter oil vapors may be permitted to join the current of gas and heavy products at different and appropriate stages of their journey through the internally preheated apparatus, as may be found desirable. This result may be accomplished by manipulating the valves 6, 9 and 10.

From the foregoing description it appears that the current of water gas is divided, that one branch of it receives the heavy products of vaporized oil and travels in their company the entire preheated interior of the apparatus, and that the other branch of it licks up the lighter vapors of the vaporized oil, and is permitted to join the first mentioned current of gas and heavy products at different stages of its journey through the apparatus, whereby the oil is subjected to a rough fractional distillation and the heavy and lighter vapors are subjected to different and appropriate treatment.

It will be obvious to those skilled in the art to which my invention relates that modifications may be made in details without departing from the spirit thereof. Hence I do not limit myself to the precise construction hereinabove set forth and illustrated in the drawings, but the claims of the inventor are—

1. The improvement in the art of carbureting or enriching water gas with oil, which consists in generating blast gas and internally heating fixing chambers by its secondary combustion, then generating water gas and subdividing it, passing one of these subdivisions in contact with oil or liquid hydrocarbon to lick up the more volatile vapors thereof, passing the other of these subdivisions through said previously heated chambers and introducing the less volatile components of the oil or liquid hydrocarbon into it near its point of generation, and reuniting the said subdivisions comparatively far from the point of generation of the water gas and permitting them to travel together portions of the said chambers comparatively remote from the point of generation of the water gas substantially as described.

2. In combination, a generator, an oil vaporizer, refractory material contained in a fixing chamber having provisions for heating it by direct internal combustion of waste gas, and the described valved pipe connections and their branches for passing a part of the water gas through the vaporizer to lick up the lighter components of the oil, and hence through portions of the checkerwork, and for passing the rest of the water gas and the heavy components of the oil through all the checkerwork, substantially as described.

Coke Production in 1895.

The following figures are taken from the report, by Mr. Joseph D. Weeks to the United States Geological Survey, respecting the production or make of oven coke in this country for the year ended December 31, 1895 :

The coal used in coking in the United States is mined from all five of its great coal fields. With the exception of that made from the coals of the Appalachian field, however, the tonnage of coke produced in the United States is quite small, but 445,473 tons of the total of 13,333,714 tons made in 1895, or about 3.34 per cent., being produced outside of this field. The production in the fields outside of the Appalachian region is a growing one, the amount there made in 1895 being somewhat larger than the amount produced in 1893 or 1894.

In the following table will be found a statement of the production of coke in the United States in 1895, by States :

State or Territory.	Establishments.	Ovens.	Yield of Coal in Coke. Per Cent.	Coke Production. Short Tons.	Value of Coke. Per Ton.
Alabama	22	5,658	58.7	1,444,339	$2.10
Colorado, Utah	0	1,169	58.6	340,357	2.76
Georgia	1	330	50.6	60,212	1.17
Illinois	3	129	62 5	2,250	2.00
Indiana	2	94	48.5	4,804	1.94
Indian Ter	1	80	43.8	5,175	3.41
Kansas	5	55	62.8	5,287	2.14
Kentucky	5	293	40.1	25,460	1.46
Missouri	3	10	65.0	2,028	1.20
Montana	3	303	45.4	25,337	7.49
New Mexico	1	50	65.5	14,663	2.01
New York	1	12	83.4	18,521	....
Ohio	8	377	56.0	29,050	2.40
Pennsylvania	99	26,042	66.2	9,404,215	1.266
Tennessee	12	1,903	57.9	396,790	1.90
Texas	1	4	54.0	286	....
Virginia.	5	832	59.6	244,738	1.32
Washington	3	110	65.9	15,129	4.27
West Virginia	78	7,834	61.6	1,285,206	1.34
Wisconsin	1	120	60.0	4,972	5.25
Wyoming	1	74	47.8	4,895	3.50
Total	265	45,565	64.0	13,333,714	1.44

The total production of coke in the United States in 1895 was 13,333,714 tons, as compared with 9,203,632 tons in 1894, 9,477,580 tons in 1893, and 12,010,829 tons in 1892. Just as the production of 1894 was the smallest in the history of coking in the United States since 1888, so the production in 1895 was the largest in its history, the nearest approach being in 1892. This great increase in production in 1895 is due to the greatly increased production of pig iron last year, just as the decline in 1894 was due to the decrease in pig iron production. The total production of pig iron in the United States smelted with coke exclusively, or with a mixture of coke and anthracite, in 1894 was 6,314,891 long tons. In 1895 it was 9,164,365 tons, an increase of practically 50 per cent. The increase in the production of coke in 1895 was very nearly the same as the increase in the production of pig iron smelted with coke or with a mixture of coke and anthracite.

Pennsylvania maintains its supremacy as the chief coke producing State in the Union, its production in 1892 being 69 per cent. of the total; in 1893, 65.7 per cent.; in 1894, 65.9 per cent., and in 1895, 70.5 per cent. West Virginia produced in 1894 about 13 per cent. of the total production and in 1895 only a little over 9.6 per cent., while Alabama, which produced 10 per cent. of the total in 1894, produced about 10.9 per cent. in 1895. Tennessee produced in 1895 about 3 per cent. of the total, as compared with 3.2 per cent. in 1894. Colorado follows Tennessee closely, producing in 1895 about 2.4 per cent. of the total. Virginia's proportion of the total in 1895 was the same as in 1894, being about 2 per cent.

The number of ovens increased in the country from 12,372 in 1880 to 45,565 in 1895. The amount of coke produced in 1880 was 3,338,300 short tons, which in 15 years was increased to 13,333,714 tons. The average price of coke was highest in 1890 when it reached 2.02 per ton.

The product per oven in West Virginia in 1895 was 164 tons ; in Alabama, 255 tons ; and in Pennsylvania, 361 tons. In 1894 the product per oven in these States was, in West Virginia, 152 tons ; in Alabama, 166 tons ; and in Pennsylvania, 235 tons.

In the following table the statistics are given of the production of coke in Pennsylvania for the years 1880 to 1895 :

Year.	Coke Produced. Short Tons.	Total Value of Coke at Ovens.	Value of Coke at Ovens, per Ton.
1880	2,821,384	$5,255,040	$1.86
1881	3,437,708	5,898,578	1.70
1882	3,945,034	6,133,698	1.55
1883	4,138,464	5,410,387	1.22
1884	3,822,128	4,783,230	1.25
1885	3,991,805	4,981,656	1.25
1886	5,406,597	7,664,023	1.42
1887	5,832,849	10,746,352	1.84
1888	6,545,779	8,230,759	1.26
1889	7,659,055	10,743,492	1.40
1890	8,560,245	16,333,674	1.91
1891	6,954,846	12,679,826	1.82
1892	8,327,612	15,015,336	1.80
1893	6,229,051	9,468,036	1.52
1894	6,063,777	6,585,489	1.086
1895	9,404,215	11,908,162	1.266

The Allegheny Mountain district includes the ovens along the line of the Pennsylvania Railroad from Gallitzin eastward over the crest of the Alleghenies to beyond Altoona. The Allegheny Valley district includes the coke works of Armstrong and Butler counties, and one of those in Clarion county, the other ovens in the latter county being included in the Reynoldsville-Walston district. The Beaver district includes the ovens in Beaver county, the Blossburg and Broad Top, those in the Blossburg and Broad Top coal fields. The ovens of the Clearfield Center district are chiefly in the two counties from which it derives its name. The Connellsville district is the well-known region in Western Pennsylvania, in Westmoreland and Fayette counties, extending from just south of Latrobe to Fairchance. The Greensburgh, Irwin, Pittsburgh and Reynoldsville-Walston districts include the ovens near the towns which have given the names to those districts. The Upper Connellsville district, sometimes called the Latrobe district, is near the town of this name.

Coke production in Pennsylvania in 1895 by districts :

District.	Establishments.	Number of Ovens.	Coke Produced.	Average Prices Per Ton.	Yield of Coal in Coke, p.c.
Allegheny Mountain	13	1,233	173,965	$1.23	64.0
Allegheny Valley	2	116	....	....	....
Beaver	2	8	1,584	2.49	54.8
Blossburg	1	200	488	2.50	56.0
Broad Top	5	460	85,842	1.75	64.4
Clearfield Center	8	695	99,460	1.32	64.0
Connellsville	29	18,028	8,181,179	1.237	67.2
Greensburg	3	118	20,309	1.10	65.0
Irwin	5	725	103,872	1.017	62.5
Pittsburgh	9	973	232,529	2.35	51.3
Reynoldsville-Walston	8	1,637	296,820	1.20	58.9
Upper Connellsville	14	1,849	208,158	1.21	65.0
Total	99	26,042	9,404,215	$1.266	66.2

The Connellsville district still remains the most important coke producing center in the United States, its production of coke in 1895 being 8,181,179 tons, as compared with 5,192,080 tons in 1894. The largest production in any previous year was in 1890, when 6,464,156 tons were made. The increase in 1895, therefore, over the largest production previous was 1,717,023 tons, or nearly 27 per cent. As the total production of coke in Pennsylvania in 1895 was 9,404,215 tons, the proportion of the Connellsville region was 87 per cent. The Connellsville region also produced 61 per cent. of the total amount produced in the United States in 1895.

In the Connellsville region the old beehive oven still holds its place, every oven in operation in this district in 1895 being of this type. Among the 80 ovens reported in the above table as building, 50 are by-product ovens of the Semet-Solvay type, which are in course of construction at Dunbar. It is probable that the character of the coke made in the Connellsville region is so good that the oven owners do not see any necessity of attempting to improve its quality. It is probable that the quality of the coke would not be improved in a by-product oven, but certainly the enormous waste of material that passes out with the gases would be avoided were the by-product ovens used.

Connellsville coke prices, as fixed by circular, were changed but twice within the year. With the opening of the year furnace coke was $1 per ton ; foundry, $1.15, and crushed coke $1.40 per ton f. o. b. at ovens. On April 1 the rates were advanced to $1.35 for furnace, $1.55 for foundry and $1.65 for crushed coke. At the beginning of the last quarter another advance was made, leaving furnace coke at $1.60 at the end of the year. The H. C. Frick Coke Company then announced another advance, making furnace coke $2 per ton with the opening of the year 1896.

Much of the coal made into coke in the Pittsburg district is slack, usually obtained from the mines along the several pools of the Monongahela river and brought to Pittsburg by barges. Latterly also considerable coal has been brought from the fourth pool of the Monongahela river to Pittsburg for coking. The indications are that the Pittsburg district will, in the near future, assume much greater importance as a coke producing center than it has heretofore enjoyed, in view of the fact that a large number of by-product ovens will be built in and near Pittsburg along the Monongahela river. In this district are included the ovens at and near Pittsburg, as well as the ovens in Washington county, that use slack from the coal mines of that county.

Notwithstanding the large consumption of coke in Ohio, and the large fields of coking coal that exist in that State, the coking industry is of slight importance. The Cincinnati district includes the ovens in the neighborhood of Cincinnati, all of which make coke from coal brought down the Ohio river from points outside of the State ; and the Ohio district, which includes the ovens at Leetonia, those in the Hocking Valley and those near Steubenville and Bridgeport, these three sections making coke from entirely different seams.

All the coke made in the Cincinnati district is from the dust and screenings of the coal yards at Cincinnati and from the coal boats and barges that bring coal from the Upper Ohio, chiefly from the Pittsburg and the Kanawha regions of West Virginia. Some run of mine and slack from Pittsburg mines is also used in the North Bend Block of ovens, which is situated on the Ohio river, a short distance below Cincinnati.

In the following table the statistics of the production of coke in the several districts of Ohio for the years 1880 to 1895 are consolidated :

	Establishments.	Ovens.	Coke Produced Short Tons.	Total Value of Coke at Ovens.
1880	15	616	100,596	$255,905
1881	15	641	119,469	297,728
1882	16	647	103,722	266,113
1883	18	682	87,834	225,660
1884	19	732	62,709	156,294
1885	13	642	39,416	109,723
1886	15	560	34,932	94,042
1887	15	585	93,004	245,981
1888	15	547	67,194	166,330
1889	13	462	75,124	188,222
1890	13	443	74,633	218,090
1891	9	421	38,718	76,901
1892	10	436	51,818	112,907
1893	9	435	22,436	43,671
1894	8	363	32,640	90,875
1895	8	377	29,050	69,655

In West Virginia five coking districts are recognized, viz., the Kanawha, the New River, the Flat Top, the Upper Monongahela and the Upper Potomac. The first two are compact and continuous. They include the ovens along the line of the Chesapeake and Ohio railroad from the west of Low Moor, in Virginia, to the Kanawha Valley. The Flat Top region includes the ovens in what is sometimes called the Pocahontas district. The fourth district, the Upper Monongahela or Northern, is a scattered one, including the ovens in Preston, Taylor, Harrison and Marion counties, on the upper waters of the Monongahela. The district we have termed the Upper Potomac includes the coke ovens in the Elk Garden and upper Potomac fields.

In the following table will be found the production of coke in West Virginia in 1895 by districts :

District.	Establishments.	Ovens.	Coal Used. Short Tons.	Coke Produced. Short Tons.	Average Price of Coke per Ton.
Kanawha	6	506	267,520	164,729	$1 64
New River	14	978	385,899	244,815	1 65
Flat Top	36	4,648	858,913	524,252	1 25
Upper Monongahela	20	1,260	392,297	240,657	1 10
Upper Potomac	2	442	183,187	110,753	1 14
Total	78	7,834	2,087,816	1,285,206	$1 34

The increase in production in 1895 over 1894 was about 8 per cent. In all districts there has been quite a difference in production. For example, the Upper Potomac increased its production from 43,546 tons in 1894 to 110,753 tons in 1895, an increase of 67,207 tons, or 154 per cent.; the Upper Monongahela district, in which are included the ovens on the waters of the Monongahela, increased from 158,623 tons to 240,657 tons, an increase of 82,034 tons, or nearly 52 per cent.; the production of the Flat Top region, strange to relate, fell from 746,762 tons in 1894 to 524,252 tons in 1895, a decrease of 222,510 tons, or about 30 per cent.; the increase in the New River district was from 140,842 tons in 1894 to 244,815 tons in 1895, or nearly 75 per cent.; the increase in the Kanawha district was something over 60,000 tons, or nearly 60 per cent.

In regard to the falling off in production in the Flat Top region it should be noted that the coke made by the Southwest Virginia Improvement Company is reported in connection with Virginia. This production increased considerably in 1895 over 1894, so that while there was a notable decrease in the entire Flat Top district in 1895 over 1894, it was not quite as great as appears in the above exhibit.

This falling off was due to the strike, which not only reduced the demand during its continuance, but, as it led to loss of yearly contracts which were placed elsewhere during the strike, it also had a marked effect on shipments after the strike ended. The indications, however, for 1896 are that the production in the Flat Top region will

be fully up to the average. It should be remembered, however, that the great increase in production in 1894 over any previous year was due probably to the strike in the Connellsville region, the Flat Top region getting many of the orders which had before been sent to the Connellsville, as in 1895 the Connellsville got many of the orders which the Flat Top had in 1894.

Anti-Vibratory Fitting for Incandescent Lamps.

The London *Journal* says that the extreme sensitiveness of incandescent gas lamp mantles, and their liability to collapse under sudden shock or violent vibration, is well known ; and the absolute necessity for some means of protecting the mantle from such liability to injury, before it can be satisfactorily applied for public lighting or use in workshops, has led to the introduction of several devices for overcoming the effects of vibration or shock to which the lamp may be subjected. For a considerable time past Messrs. W. R. Clay & Co., of Bolton, have been conducting experiments aiming at the production of an appliance which would render the incandescent lamp suitable for street lighting. They have proceeded on the lines that the incandescent systems will have the best chance when they can be made to conform as closely as possible to present conditions—that is, without any material alteration having to be made in the lanterns and fittings now in use, and without in any way hampering the lamp cleaners or lighters in their work ; and they have succeeded in producing an anti vibratory appliance which, in a very simple and effective manner, completely protects the mantle from destruction through any shock or vibration which could be produced by the heaviest street traffic. The appliance, it will be remembered, was alluded to by Mr. Alderman Miles in the course of the discussion on Mr. Dexter's paper at the recent meeting of The Gas Institute.

Messrs. Clay were induced, in the first place, to carry out these ex periments with the view of meeting the requirements of the Bolton Corporation, who some time back introduced the incandescent system for their street lamps. The exceptionally heavy traffic passing through the streets of this important center of the cotton manufacturing indus try and the engineering trades, however, caused an amount of vibra tion which was absolutely fatal to the fragile mantles of the incandescent lamps, and the constant collapse of the mantles became so great a source of expense that, very reluctantly, the system had to be abandoned. The very simple design which Messrs. Clay have now introduced, and which is shown in the accompanying illustrations, has enabled the Corporation to return to the system of incandescent lighting. Messrs. Clay's anti-vibrating appliance has now been in use for the last six weeks, with the result that during that period not a single mantle has been broken by the vibration, while previously there were numerous collapses every night the lamps were burning. This ar rangement has, in fact, given so much satisfaction to the Corporation that they are considerably extending their lighting on the incandescent system, and have placed further orders with the firm for the supply of their anti-vibratory fittings.

Briefly described, the arrangement which Messrs. Clay have introduced consists in detaching the burner altogether from direct connec tion with the service pipe, and practically suspending it upon a specially manufactured solid drawn copper tube, about 5 feet in length, ⅛-inch bore, and of 21 metal ; this tube being directly attached to the service pipe. The manner of constructing this light copper tube, so as to suspend the burner, will be seen in Fig. 1, which shows the incandescent light, with its anti-vibratory fitting, attached to an ordinary street lamp post. The tube is slightly to one side, immediately under the burner. and then carried up to near the top of the lamp chimney, round which it coils several times, and is then taken down again outside the chim ney to the incandescent burner. By this arrangement the burner and chimney are held practically in a spring coil, which gives a resilient suspension to the burner—allowing it to move freely in any direction, and effectually overcoming any shock or vibration which would be at all injurious to the mantle.

With the object of thoroughly testing the complete efficiency of this arrangement, Messrs. Clay have submitted their appliance to some exceptionally severe tests. A lamp furnished with one of these fittings was subjected to a shock so violent that, while the chimney glass of another burner in its immediate proximity was broken in two at the moment of impact, the mantle in the lamp fitted with the anti vibratory arrangement was not fractured in the least, though both burners were equidistant from the point of impact, and each at the summit of a standard fixed to the top of a bench. Further tests were applied with successive shocks caused by lifting one end of the bench 9 to 12 inches from the floor and suddenly letting it fall ; but these failed to fracture the mantle. Messrs. Clay state that they have been unable to fracture the mantles by the most violent horizontal and oblique shocks against the lamp pillar, short of overturning the whole structure. The lamps have also undergone further severe tests in a neighboring engineering works, where an incandescent lamp hung upon one of the fittings described has been placed in close proximity to a couple of powerful

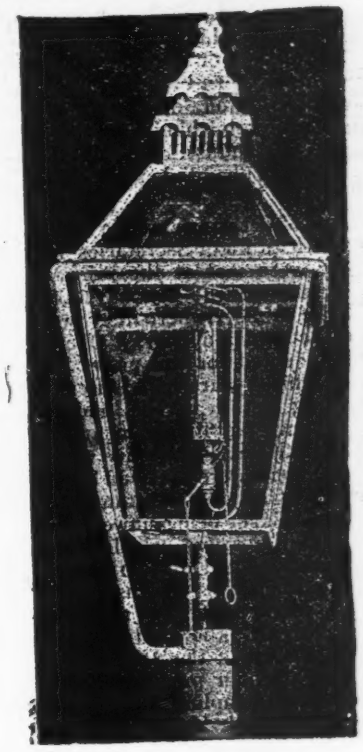


Fig. 1.

steam hammers, working night and day, for the last three weeks, without suffering any perceptible injury. Tests were also made, in the presence of our representative, at Messrs. Clay's establishment in Bolton, during a visit last week. One of the incandescent burners suspended on their anti-vibratory fitting, and attached to an ordinary street lantern, was subjected to exceptionally violent horizontal and oblique shocks—much more violent, in fact, than would be probable

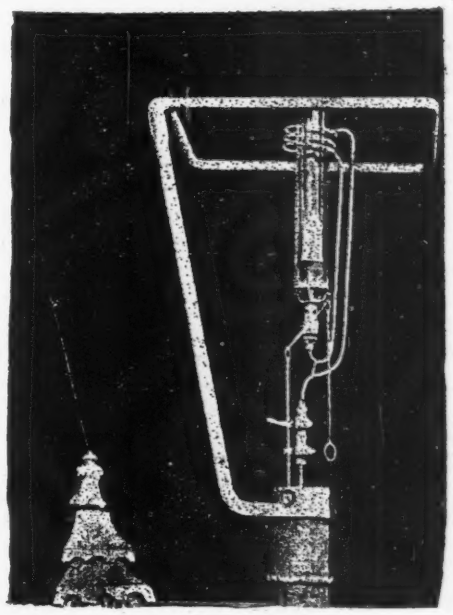


Fig. 2.

from the heaviest street traffic ; and neither the chimney nor the mantle was in the slightest degree affected. Less severe tests, however, applied to two incandescent lamps fitted up in the ordinary way, and attached to the top of a bench, immediately brought about the complete collapse of the mantle.

In addition to the effectiveness of the arrangement for overcoming vibration and shock, Messrs. Clay have also kept in view the necessity

for freedom of movement, so that it may be possible to as easily remove the lantern from its cradle when an incandescent burner is inside as it is now with an ordinary burner. Fig. 2 represents a street lamp supplied with the anti-vibratory fitting, but with the lantern removed from the cradle—showing that there is no connection to be broken in order to effect this operation. In fact, the simplicity of the arrangement is perhaps as important a feature as its efficiency. The gas has direct access from the main to the burner without the intervention of any other connection; and there is absolute freedom from loose parts or fittings requiring renewal—the whole of the appliance being one solid piece of metal throughout.

We understand the only objection that has been raised to this appliance is that possibly there might be an accumulation of naphthaline in the bend of the tube immediately under the burner. Messrs. Clay's answer to this, however, is that the gas, in its passage through the tube to the burner, is both heated and dried, so that there is no possibility of an accumulation of any liquid in the bend; while a further advantage of the heating of the tube is that it is a very efficient protection of the chimney from fracture, by preventing a too sudden cooling of the glass. It may be added that, although the illustrations show a simple form of the appliance for the present "C" burners, Messrs. Clay are preparing another design for the bulb burner, which is coming into use for lighting large areas; and they are also designing a bye-pass arrangement in connection with the fitting, by bringing a small tube from the service cock to the burner above. They likewise propose to utilize the principle from other than street lighting, as they are satisfied their arrangement must prolong the life of the burner under any conditions, even in domestic lighting.

The Use of High Voltage Lamps.

By Mr. W. N. Stewart.

As near as can be ascertained, 220-volt incandescent lamps had been used in this country in but two central stations prior to the year 1894, viz., Allegan and Detroit, Mich.

In that year the writer entered into an extensive correspondence with several of the prominent lamp manufacturing concerns, and all attempted the production of a commercial 220-volt lamp. It is needless to say that most of the attempts were very crude, and that these lamps lacked nearly every requisite of efficiency, durability and light-giving power. But patience prevailed, as it usually does, and several of the factories are now producing an article which may be considered very near perfection.

Within the last two years central lighting stations using these lamps exclusively have been established in the following towns: Adrian, Waseca Wells, Lake City, Windom and Preston, in Minnesota; Fort Howard, Wis.; Norwood, O.; Ontonagon, Mich., and Alta, Ia. There are several others, and some isolated plants, and many other similar installations are in contemplation.

All of these plants are situated in towns of from 2,000 to 5,000 inhabitants, and most of them have in use a few constant-potential arc lamps for street or commercial lighting. Dynamos were furnished by several of the large manufacturing companies, and it should be remarked that in every case they are directly connected to high speed engines. None of the plants have a capacity of over 300 lamps of 16 candles, and most of them use only one 50 or 60-kw machine. The 220-volt system is usually recommended by local engineers for towns where distances are not prohibitive. The plants named are giving a perfectly satisfactory service, and some have been extended by the purchase of additional machinery. Many of them are operated in connection with the village water-works system, and most are owned by the municipalities.

The lamps now used have but one defect, and that is the lack of high efficiency. It is well known that lamps of low voltage use less watts per candle than lamps requiring higher E. M. F. The stock argument in favor of alternating systems of distribution used to be that lamps of 50 volts could be used; but at present one finds that lamps of 110 volts are more commonly employed. There is no logical reason why the conventional 110 volts should be adhered to beyond the force of custom, if others of higher voltage can be had of equal life and illuminating power and approximate efficiency.

Several manufacturers now produce 220-volt lamps averaging in efficiency 4 watts per candle, or 64 watts for each 16-candle lamp. We, of course, hear a great deal about 50-watt lamps of 110 volts, but they cannot be found in the average village central station. The customer will not use them because, in most cases, he pays for current at flat rates and buys his own renewal lamps. He wants a good light and few renewals, and does not care about the technical questions involved. Therefore the average lamp used in village plants consumes from 55 to 60 watts. In stations selling current by meter and furnishing free renewals the conditions are, of course, reversed, and if the lamp efficiency was the deciding factor the 220-volt lamp, as at present made, would be little used.

A village central station, to be successful, must, above all things, be thoroughly simple. Every complication and every danger adds to the operating expenses and repair account. Can anything simpler than a two-wire, direct-current system operated from a single compound-wound, direct-connected dynamo be devised? Compare it with a three-wire system, using two belted, high-speed dynamos, a double set of switchboard apparatus and the illogical neutral wire. Or the alternating system, with its high-speed belted dynamo and exciter, its high-pressure primaries and multitude of transformers. If simplicity tends to lower operating expenses, certainly the advantage is with the single, direct-connected unit and its two wires without transformers.

Belting is a continual expense both in maintenance and power required to run it; small dynamos at high speed are not desirable; there are losses in neutral wires and lamp breakages owing to bad balancing, transformers leak and are peculiarly disposed to damage from lightning, while the danger to life is always present. I am therefore very well satisfied that the average village station operates at less cost when the 220-volt system is used than with any other, the less efficiency of the lamp to the contrary notwithstanding. What is lost in the lamp is gained twice over in the engine room and on the line. If this line of argument is true, applied to small plants, why should it not be true of larger installations? Let us see what it actually costs to operate those 220-volt stations.

Careful tests have been made to ascertain this important factor. In one plant four men were under pay; 1,000 incandescents and eight arcs of six amperes each were connected. Fuel cost $2.50 per cord for pine slabs; the plant operated 14 hours daily, the eight arcs and 65 incandescents of 32 candles burning all night. Eight per cent. per annum was allowed on entire cost of plant for depreciation. The total cost proved to be 4.5 cents per kilowatt-hour, which also included all cost of pumping the village supply of water, except depreciation on mains and pumping machinery. When it is remembered that reliable statistics show that the average cost of producing current in American stations of similar size is about 9.3 cents this showing is certainly remarkable.

In other words, contractors can now guarantee a cost of 5 cents per kilowatt-hour in small stations and 4 cents in larger, provided they use good machinery and do first-class work.

The 220-volt lamps average from 1,200 to 1,500 hours life; the light is well diffused, and the lamps can be used with any good socket. Fuses should be long and wiring carefully done. The large station at Edinburgh is to use these lamps on a three-wire system, or 440 volts. I see no reason why the same cannot be done here, with the underwriters' consent. The efficiency of the lamps will no doubt be improved gradually, but if current is sold at 10 cents per kilowatt-hour net, and produced for 4, I fail to see any reason why both company and customer should not be satisfied. Such a simple means of extending the scope of the direct-current system is certainly worthy of the most careful investigation, and this it is of late receiving. My original idea was that the direct-connected, self-regulating dynamo deserved a larger market than that offered by isolated plants solely, and thus far my experience with its use in connection with 220-volt plants has been extremely satisfactory.

The Temperature of Certain Flames.

W. Noll Hartley, Prof. of Chemistry in the Royal College of Science, Dublin, in a paper on "The Temperature of Certain Flames," communicated to the *Journal of the Chemical Society*, says:

Having for some years past given much attention to flames and the nature of the spectra they emit, I have endeavored to ascertain, as far as practicable, the temperatures they were capable of attaining. Unfortunately no thermometer or pyrometer, even of the nature of H. Le Chatelier's thermo-electric couple, is suitable, because the mass of the material to be heated is too large, and in the use of the latter instrument its destruction would be involved in the measurements attempted. Professor Vivian B. Lewes has used this form of pyrometer with wires of very small dimensions for measuring the temperature of flames. It is impossible to measure with accuracy the maximum temperature of any

part of a flame of small dimensions, because if a body is placed within the flame it must necessarily reduce its temperature.

I have elsewhere mentioned the fact that a candle flame is hot enough to melt platinum, if the material to be melted be only small enough to be surrounded by the heated gases, and not large enough to conduct the heat away.

From recent publications and discussions I imagine there must be some misconceptions prevalent as to the temperature of flames. In this connection I may quote Sir Humphrey Davy: "The real temperature of visible flame is perhaps as high as any we are acquainted with. Mr. Tennant was in the habit of showing an experiment which demonstrates the intensity of its heat. He used to fuse a filament of platinum in the flame of a common candle; and it is proved by many facts that a stream of air may be made to render a metallic body white hot, yet not itself be luminous." "Flame is gaseous matter heated so highly as to be luminous, and to a degree of temperature beyond the white heat of solid bodies, as is shown by the circumstance that air not luminous will communicate this degree of heat. This is proved by the simple experiment of holding a fine wire of platinum about $\frac{1}{20}$ of an inch from the exterior of the middle of the flame of a spirit lamp, and concealing the flame by an opaque body; the wire will become white hot in a space where there is not visible light."

Temperature of a Candle Flame.—That combustion in a candle flame is productive of a very high temperature is capable of proof in various ways.

1st. Pure gold leaf melts with extreme ease in any part of a candle flame where there is complete combustion, from the point where the wick curls over, or just under the tip of the curl, up to the apex of the flame. The highest temperature is about half-way up, near the zone of greatest luminosity, and either within or near to the mantle. Hence the temperature, at the lowest computation, cannot be less than 1,045° C. at these positions. This experiment is not open to the objection that the gold combines with carbon contained in the flame, and that by such change its melting point is lowered, for this is not the fact.

2d. Faraday has described how he melted platinum wires $\frac{1}{3000}$ of an inch in diameter in a candle flame. I have myself melted fine wires of platinum in a candle flame, and the melting point of this element cannot be less than 1,775° C. It has been remarked that a possible fallacy may underlie the deductions drawn from the behavior of a platinum wire in a flame containing free carbon or carbonic oxide, on account of the specific chemical action which these substances may exert on the metal. While fully recognizing the propriety of drawing attention to this matter, it is right to say that I can find no evidence of the melting point of platinum being lowered by the action of carbon, and according to my experience it is not materially altered.

3d. The most striking evidence of the very high temperature even of a candle flame is obtained by a careful examination of the spectra which can be observed in it. The line spectrum of sodium, which is caused by the dissociation of its oxide, may usually be seen, and the spectrum of calcium oxide may be obtained by putting a trace of lime on the wick. But by far the most convincing proof of the very high temperature of the flame is the well known fact that the spectrum of carbon is always visible in the mantle. The two groups of bands in the yellowish green, with wave lengths about 5,627 to 5,372, and 5,170 to 5,086, are particularly brilliant, and also the group in the blue, wave length from 4,743 to 4,688. Any flame showing these bands, which belong to the vapor of carbon, and which can show the radiations characteristic of the vapor of calcium oxide, must be at a temperature approaching that of the oxy-hydrogen flame.

Confirmatory Evidence.—In order to ascertain whether heating a platinum wire in a flame containing free carbon gives rise to the formation of a compound of platinum and carbon which melts at a lower temperature than pure platinum, the following experiments were made: A length of about 17 inches of platinum wire was fixed to a support by means of a screw, the end of which nipped the wire; the opposite end was allowed to lie on a triangular file as a support, and through the wire a current of electricity was passed. The wire was then very gently drawn along the flat horizontal surface of the triangular file until it was obvious that the metal was near its melting point. Then, with increased caution, the wire was shortened, but without exercising the slightest tension, until it grew hotter, and finally gave way by fusion. The portion of the white hot wire dropped immediately over the sharp edge of the file, and was then squeezed down upon to show exactly where contact was made, and the distance from this point to that end of the wire which had not been heated by the current was carefully measured. By deducting its length from the total length of the wire the exact quantity which had been heated to melting point was ascertained. Some of the same wire was then heated for ten or fifteen minutes in a broad batswing burner until it had lost its brightness. From time to time a coating of carbon could be seen upon it. This wire was then tried exactly in the same way, the results obtained being as follows:

Length of Wire Heated to its Melting Point.

	I.	II.	III.
Pure platinum	$10\frac{1}{16}$ths	$10\frac{2}{16}$ths	10 inches,
Carbonized platinum....	$10\frac{3}{16}$ths	$10\frac{4}{16}$ths	10 "

It will thus appear that the melting point of the metal had not been altered.

That the current from the 15-storage cells decreased by use in the interval between the first and second pairs of experiments accounts for the reduced length of wire shown to have been heated, but inequalities in the wire and also increased accuracy in performing the experiment may also have had effect.

Thus the doubt that was cast upon the accuracy of Professor Smithell's statement of the high temperature of the mantle of the bunsen flame may be said to be dissipated.

The melting of platinum wires in a candle flame cannot be carried out with any ordinary wire. That which I used was drawn by Wollaston's method—a core of platinum inside a tube of silver. The silver was dissolved away from several short lengths of wire by digesting it in strong nitric acid in some instances, for a period of a week, until no more silver was removed, and the wires were then washed with distilled water until nothing further could be removed from them. They were invisible to the unaided eye, except when they were struck by a ray of sunlight. It is difficult to introduce more than very short lengths of wire into the flame, because the uprush of heated gas or vapor carries the wire away with it. But, if held by two ends, the wire, though invisible, may be passed into the flame, when it instantly melts.

I have made some experiments on other flames, all of which have a temperature as high as that of a candle. Platinum wire 1-1,000th of an inch thick melts in any part of a hydrogen flame 1 inch in height; it melts in the inner cone of a cyanogen flame with extreme ease; also in the flame of carbon monoxide, when only 1 inch in height, if introduced into the inner cone of the flame, and with great ease if placed at the tip of the cone. It must be recollected, however, that a carbon monoxide flame 1 inch in height is of much larger volume than a candle flame of this height, because the gas does not ignite if allowed to flow under pressure from a narrow orifice.* In this case the orifice was a platinum tube of $\frac{1}{3}$th of an inch internal diameter. The temperature thus recorded cannot have been lower than 1,775° (Violle).

The latter experiment goes to confirm my calculation of the temperature of the Bessemer flame, based on the comparison of its spectrum with the spectra produced by the oxy-hydrogen flame, and from the fact that the flame from a converter is the result of the combustion of carbon monoxide mixed with about twice its volume of nitrogen, the gaseous mixture burning in air with an initial temperature of about 1,500°.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, July 10th, 1896.

Some Properties of Acetylene.—Tunneled Retort Benches.—What is 20-Candle Gas?

At the last meeting of the Nottingham Section of the Society of Chemical Industry, Prof. Clowes contributed some important information on the properties of acetylene. He said that the ease with which this gas could be generated from calcium carbide had enabled him to determine the proportion of it that must be present in air in order to constitute an explosive mixture, and he found that the presence of any percentage proportion between 3 and 82 per cent. was sufficient to enable the mixture to burn throughout without further admission of air. This was a far wider range, he stated, than had been shown by any other gas yet experimented upon, and it was probable that the wideness of the range due to true combustion was increased in the case of acetylene, by its known power of undergoing endothermic decomposition. Prof. Clowes also illustrated, by experiment, the applicability of his flame cap method to the detection of proportions of acetylene below 3 per cent. In the course of the discussion which followed the reading of the paper Mr. Carulla observed that Prof. Lewes had already pointed out that certain acetylene explosions might be accounted for by the

presence of calcium phosphide, an impurity that was introduced by the use of lime in which phosphates were present, for its manufacture. Calcium carbide containing phosphide would give off phosphoreted hydrogen on contact with water, and this would fire an explosive mixture of acetylene and air. According to Mr. J. T. Wood, vigorous attempts are being made to push acetylene in France, in which country it even enjoyed its own special magazine. A French chemist—M. Emile Gautier—had written an article on the domestic uses of acetylene, in which he spoke very decidedly as to the risks of using it in large quantities, saying that the addition of water to 25 pounds of carbide or so was as bad as lighting a cigar in a powder magazine. His view seemed to be that the only way to use acetylene was in the liquid form. A company was to be formed for the delivery of pure compressed liquid acetylene, and M. Gautier spoke very hopefully on behalf of this project. In replying, Dr. Clowes said there was no doubt that many accidents had been occasioned by impurities in the carbide, and that the reports to the effect that acetylene would explode spontaneously on escaping into the air were originated by the presence of phosphoreted hydrogen. But they were now making the carbide sufficiently free from phosphide to be free from danger, and the carbide used that evening had been carefully tested, and was certainly free from phosphorus. He understood that the acetylene lamps used on the Continent were not successful, as they generated the gas much faster than it could be burnt.

There is probably no point upon which gas engineers are more mis understood by the public than in respect to their attitude towards new inventions. They are popularly supposed to be bitterly averse to any means or process that may possibly at some future time come into competition with the one they at present work, and to be willing to resort to any tactics (disreputable ones preferred) in order to stifle or write it down. They are also credited with being opposed to progress in any shape or form, without being open to consider how their own positions may be affected by such a policy. Whereas their real position is that they simply want the truth—the whole truth and nothing but the truth. They have heavy responsibilities, and do not feel called upon to undertake to make a practical and commercial success of every new idea that is brought out. But they certainly have no desire to make gas in the same way that their fathers did, to the exclusion of modern improvements. It cannot be said that any real advancement ever met a cold or stifling reception when once its reliability was proved. So with acetylene. They want to know the truth about its properties, and the cost of making it, and will welcome the information given by Prof. Clowes. The wide explosive range, however, is not a desirable property for any gas that is to be dealt with in bulk. The possible presence of phosphorus in the material used for its generation must also receive careful attention. With regard to the distribution of compressed gas, in the liquid form or otherwise, the cost of compression, distribution and collection, and wear and tear of cylinders, must necessarily be so large as to put it out of the running in competition with ordinary gas at anything like an ordinary price.

An important advance in economical construction of retort benches has been made at the East Greenwich Station of the South Metropolitan Gas Company. Originally the general plan was to keep the main flue outside the setting, usually on the top. Some years ago, when generator furnaces were introduced, it soon became apparent that there was a waste space at the back of and between the furnaces, which could be turned to account for the purposes of the main flue. Some who preferred to keep to the top flue made this space hollow, simply with a view to economize material. But it remained for a foreman at the works just mentioned to suggest that this space should be utilized as a trafficable tunnel from end to end of the settings, and that the clinker doors and ashpans should open into it on each side. The advantages of this simple plan are obvious. It will be apparent that I am speaking of stage floor retort houses as usual in large works, and also of double or through settings. But the gist of the idea appears to rest in keeping the clinkering door and ashpan away from the mouthpieces, as would be done with an ordinary ground floor single setting, by putting the furnace door and ashpan at the back instead of at the front. Returning to the stage floor retort house, it is evident that the whole of the area in the space known as the coke vault is left available for the storing or the loading of coke. Instead of taking it away as fast as it comes down, it can be left where it falls till a heap 6 feet or 8 feet high has accumulated, if desired, and a large proportion can be loaded direct without a second turn over. The furnace men are free to conduct their operations without the interference caused by the removal of coke, and without the risk of hot coke or tools being dropped upon them from above. They are also undisturbed by coke or coal dust, which is a great trouble to them under the usual way of working. Altogether it is not too much to claim that the tunnel at East Greenwich is the starting point of new improvements in retort house working, that will be adopted in several different ways according to circumstances. Several of the early works on gas contain illustrations showing the mouthpieces on one side and the furnace doors on the other, but at present the universal plan is to do the whole of the work from the front of the setting.

A case illustrating the glorious uncertainty of the law has lately been tried before the magistrates at Birkdale, a suburb of Southport. The corporation of this popular resort are the owners of the gas works, and as such supply, amongst other outlying townships, the district of Birkdale. Under the terms of their Act of Parliament, they are bound to supply 20-candle gas, and for some years past the district council of Birkdale have been contending that the quality is below the standard, while the Southport Corporation maintain that they are fulfilling their obligations. The Birkdale Council have brought the dispute to a head by carrying the matter into the law courts and taking out three several summonses against the Southport Corporation for failing to supply gas of the illuminating power and quality specified by the Southport Improvement Act. The whole dispute turns upon the proper construction to be placed upon the 35th Section of that Act, which reads as follows: "The gas supplied by the Corporation shall be of such illuminating power as to produce from an Argand burner having 15 holes and a 7-inch chimney, or other approved burner and chimney, or burners, a light equal in intensity to the light produced by 20 sperm candles, 6 in the pound, burning 120 grains per hour." The Southport reading of this section was that it did not of necessity tie them to the 15 hole Argand, but left them free to use any approved (*i. e.*, suitable) burner or chimney, or burner without a chimney. But the Birkdale view was that the word "approved" meant "to be accepted or agreed upon by both parties," and that in the absence of any approved appliance, the 15 hole Argand, as described, was to be used For some years past the Southport Corporation had used a burner known as the Silber Argand, which they considered fitted and suitable for testing 20-candle gas, but the Birkdale people would not budge an inch from the 15-hole Argand. Apart from this point of law, there was no substantial disagreement on matters of actual fact. The evidence on both sides showed that the results afforded by the 15-hole Argand as specified, came out 4 to 5 candles below the Silber, so that what the Southport gas engineer called 20-candle gas was rated at about 16 by the examiner at Birkdale. The Southport contention was that they were entitled to use the Argand burner which was most suitable for burning their gas, which in other words was admitted to mean getting the best duty out of it. For they claimed that an Argand burner could not in any sense increase the light, and that the cause of the low reading with the 15-hole Argand and 7-inch chimney was the unstability of that appliance for dealing with gases so rich as 20 candles, which frequently could not be consumed in it at the rate of 5 cubic feet per hour without tailing of the flame above the chimney, and smoking. In support of this they were prepared to produce analyses of the gas and other evidence as to its quality, and also had strong evidence as to the suitability of the Silber Argand for testing 20-candle gas. The magistrates favored the Birkdale argument, and pronounced the offence proved, adding that as a fact there was not at the time of the passing of the Act in 1871, any approved burner capable of testing 20 candle gas. According to the latter clause it would appear that the magistrates suspected the Southport Corporation of endeavoring to take the benefit of a subsequent improvement. A fine of £10 for each offence was inflicted, and it, of course, carried costs with it.

The above may be correct law, but it is not justice, for it is notorious that the 15-hole Argand and 7-inch chimney do not correctly indicate the value of gases over some 18-candle power, even if it is possible to burn such gases in this appliance at the rate of 5 cubic feet per hour without tailing or smoking. It is scarcely too much to say that it is impossible to get a proper test of the gas, and modern Acts testify that if the gas to be tested is so rich as to tail over the 7-inch chimney a 6-inch chimney should be used.

The Southport Corporation certainly committed an oversight in ever consenting to accept a section such as that above quoted, because, even in 1871, it was known that the flat flame was the proper test for 20-candle gas and the Argand for 16 to 18-candle. A vendor of tea or sugar would certainly feel aggrieved if compelled by law to weigh out his commodtties in scales that had a bias of 20 per cent. or so towards the buyer. Nor would the explanation that such a restriction was good law afford him much solid comfort. Ten years ago such a decision would have been simply ruinous to the Southport Corporation. Cannel was the only available enricher, and the cost of enrichment

was put at 1½d, to 3d. per additional candle. Now there are p'enty of oil and water processes available, and the question for them to consider will be the best method of bolstering up the gas so as to get past the Birkdale examiner, which does not necessarily mean making the best gas for the requirements of customers. Truly, Mr. Geo. Livesey's recent sweeping denunciation of photometry was not far wrong.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. ADAM WEBER, proprietor of the Manhattan Fire Brick and Enameled Clay Retort Works, of this city, informs us that he has been awarded the contract for the construction of 12 benches of sixes, at the works of the Boston (Mass.) Gas Light Company. Mr. Weber is also under contract to instal some new benchwork in the plant of the Tacoma (Wash.) Gas and Electric Company.

LAST week we said that the Bridgeport (Conn.) Gas Light Company would likely put in force a new schedule of gas rates, and it seems that even when we were making the prediction the Company had already decided upon the course it would take—at least, the following inclosure from a correspondent, under date of the 19th inst., tends that way:

"A year ago the Bridgeport Gas Light Company made a reduction in its rates of 20 per cent. per 1,000 cubic feet, with a promise to make a still further reduction in the near future, if an increase in the consumption of the commodity should warrant it. Its hopes have been realized and the promise will be fulfilled. At a meeting of the Board of Directors (held on the afternoon of the 15th inst.) it was unanimously voted to make a reduction of rates—placing Bridgeport on a par with New York, New Haven and Hartford. The new schedule will go into effect, beginning September 1, as follows: $1.50 per 1,000, gross, with a discount of 25 cents per 1,000 feet if bills are paid within 5 days after presentation, which will make the rates as follows: $1.25 per 1,000 feet. net; $1.20 per 1,000 feet, if $100 to $500 worth is used per quarter; $1.15 per 1,000 feet, if $500 to $1,000 worth is used per quarter; $1.10 per 1,000 feet, if $1,000 to $1,500 worth is used per quarter; $1.05 per 1,000 feet, if $1,500 to $2,000 worth is used per quarter; $1 per 1,000 feet, if $2,000 worth or over is used per quarter. The same rates apply proportionately to those who pay monthly. The Directory is composed entirely of representative Bridgeport men, who are identified with the manufacturing and banking interests of the city, and they believe that the public will appreciate and encourage their effort to supply the best quality of gas at the lowest possible rate. The subject of using gas for fuel is being considered at present very seriously. It is an ideal fuel, especially for summer use, and at $1.25 per 1,000 cubic feet every one can afford to use it, for the reason that it requires only about one-third the quantity of illuminating gas to produce the same results as obtained from ordinary fuel gas. By means of atmospheric burners attached to all the ranges and stoves sold by the Bridgeport Gas Light Company, a proportion of about two-thirds air is combined with the illuminating gas, making the blue flame the finest quality of fuel gas, with intense heat, at a comparative cost of from 40 to 45 cents per 1,000 cubic feet for ordinary uses, and less in proportion to quantity used. For brazing and annealing purposes it is unsurpassed. It is especially recommended for its safety, as, in case of any escape by leakage or otherwise, its odor gives immediate warning, thus preventing the danger which attends the use of odorless fuel gas. The Company has on hand at its showrooms, 31 John street, a large and varied assortment of ranges, stoves, hot plates and appliances which are sold at cost; and it will be pleased to explain their uses in detail to all who so desire."

THE betterments on the storage station at the foot of Wister street have been completed, and the result is a very much more satisfactory gas supply in the Germantown and Chestnut Hill districts—both of which are suburban districts of Philadelphia.

THE organization meeting of the Massachusetts Pipe Line Gas Company was held in Boston, pursuant to the advertised call for the same. The officers chosen were: Directors, Henry M. Whitney, Albert N. Parlin, Henry F. Dimock, F. S. Pearson, George B. M. Harvey, Jas. Philips, Jr., and George H. Towle; President, Henry M. Whitney; Treasurer, Frederic Tudor, Jr.; Clerk, Geo. H. Towle. The initial capital stock of the Company is $1,000,000, and a call thereon of 15 per cent., payable on or before August 15th, was made.

MR. JOSEPH BARKER, one of the incorporators of the Omaha (Neb.) Company, and who held his original investment therein up to his demise, died in Omaha about a fortnight ago. He was born in Sheffield, England, in 1832, and came to this country in 1851. He first engaged in business in Salem Ohio, but eventually settled in Omaha (1856), where the balance of his life was spent. Prudent investments in real estate and close attention to banking and other channels of trade resulted in the putting together of an important estate. He was prominent in the political and social life of Kansas City, and was noted for the sensibleness of his unparaded charities. His wife and a son survive him.

AT the annual meeting of the Stillwater (Minn.) Gas and Electric Light Company the following officers were chosen: President, Isaac Staples; Vice-President, E. L. Hospes; Secretary and Treasurer, R. S. Davis; Superintendent, N. N. Johnson.

THE Pintsch compressed oil gas plant at Easton, Pa., for the supply of high candle power gas to the passenger coaches of the Lehigh Valley Railroad, is in operation. The Superintendent is Mr. Edward. P. Pursell.

THE proprietors of the Portsmouth (Ohio) Gas Company have authorized Superintendent Prichard to construct an additional storage holder, to have a capacity of 75,000 cubic feet.

AT the annual meeting of the Shelbyville (Ind.) Gas Company the officers elected were: Directors, Jacob G. Deprez, J. B. Randall, George Dunn, John Leefers and G. W. F. Kirk; President and Superintendent, George Dunn; Vice-President, John Leefers; Secretary, G. W. F. Kirk; Treasurer, J. B. Randall.

THE Massachusetts Board of Gas and Electric Light Commissioners held a hearing some days ago in Millbury, for the purpose of taking testimony over a difference that cropped out between the local electric lighting company and the authorities respecting the price that should be paid as to the lighting of the place—although Millbury is a small town, and despite the fact that the amount involved is also undersized, we report the proceedings at length merely to show how thoroughly the work of the Commission is done. The full Board was present, and others on hand were Mr. T. H. Sullivan, who appeared for the town; Mr. H. W. Aiken, who represented the Millbury Electric Company; Messrs. Hall, Booth and Hakes, of the town's Selectmen, and many taxpayers. Chairman Barker read the complaint received from the Selectmen, the main tenor of which was that the Company was not giving the town proper service, and also read the call for the hearing. Mr. Sullivan opened the case by saying that up to a year or so the town had paid $80 per light annually, but that in 1895 the price was cut to $75. At the last town meeting it was voted to reduce the annual appropriation for street lights to $2,000, which would put the rate per light at less that $75. The Selectmen notified the Company of the cutting down of the appropriation, whereupon the Company shut off the service on May 1. Afterwards it was voted at a special town meeting to appeal to the Commissioners for a settlement of the affair. Selectman Booth was the first witness. He said that complaints were made that lights were out when they should have been lighted, but that no systematic attempt had been made to keep a record of such extinguishments. The Company was supposed to furnish lights of 1,200 candle power each, on a moontable schedule. Complaint had also been made frequently that the lights were not up to the stipulation in respect of candle power. The Selectmen wanted the Board to fix a price that would be fair to the town and to the Company. Mr. Moore, Agent for the Cordis Mills, was sure that the quality of the lights varied from night to night, and he knew that extinguishments were frequent. He admitted that the trouble with the light in front of his house might be due "to boys playing with it." He further thought that the lamps were not lighted early enough on winter evenings. Mr. C. T. Aldrich then gave it as his opinion that the service was wretched, and that $2,000 was far too large a sum to pay for it. The Company would not agree to anything that was fair; further, the plant of the concern was poor, and the management of it was slipshod. One or two others followed in very much the same sort of strain, after which Mr. Ryan, Treasurer of the Company, testified. He said he was Treasurer of the Company for two years or more, and did practically all the buying therefor. The Company commenced business in 1887. Yearly contracts were made for coal, which at present cost $3.97 per ton, delivered at the power plant. The salaries paid the three men in the employ of the Company amounted to $1,550 per year, and his house was lighted free. He thought the business was properly conducted, and paid cash in every instance where a paying discount could be received. Had received no definite complaints about the lights, and any complaints that were made were made in the form of a slur

on the Company. Complaints of any nature were always attended to. Had never refused to furnish lights after 12 o'clock; in fact, all one night, at the request of the Selectmen, the lights were lighted. He admitted that no "formal" tests of the candle power of the town public arcs had been made; but thought it was the duty of the town; not that of the Company, to make such tests. All the arc lamps on circuit were maintained on town account, none being supplied on ordinary commercial account. The town paid separate or agreed upon prices for the incandescent lighting of the Town Hall, the Selectmens' rooms, the Post Office, Public Library and so on. Meters were used in private houses, but stores were lighted on the contract basis. The control of the Company was held in Worcester. Had kept account of the "quantity of light" produced, but not of the "energy required for its production." Had received no definite complaints regarding quality of lights. The Company had paid a dividend of 3½ per cent., which remark led Lawyer Sullivan to ask why it was not more, to which witness replied, "We did not make any more." The Company was losing money in the arc business at $75 per lamp per year, but that it made a profit on its incandescent service—$3,000 per year was its income from the latter. The incandescent and arc services were maintained from the same dynamos. This led Mr. Sullivan to ask how it was, then, that Treasurer Ryan knew he lost money on the arcs. Mr. Ryan replied he could not explain, as he "was not an electrician." Mr. Tibbetts, the Company's Superintendent, said that he gave practically all his time to the duties of his position, and that he gave the closest attention possible to watching the behavior of the lights from the hour they were put in work. Chairman Barker questioned Superintendent Tibbetts about the plant and its capacity, and his replies, in our belief, did not strengthen the Company's position. Lawyer Aiken then summed up for the Company, the main burden of his contention being that the objectors were "kickers." He thought that $80 would not be any too great a price to pay for each arc per year, although the Company was willing to accept $75. In any event, however, it was satisfied to accept the verdict or recommendation of the Commissioners. Mr. Sullivan, in closing for the petitioners, did not add any strength to their position, although his argument was made at considerable length. The Chairman of the Commission (Mr. Barker), in announcing the termination of the hearing, said: "We close the case at this point, and will take the matter under advisement. We intend to look into the details carefully. We will render a decision as soon as possible, but if there be any delay the town will not suffer under the present management."

THE City Council of Sedalia, Mo., has renewed the franchise of the Sedalia Gas Light Company, for a period of 30 years. Under the ordinance the Company agrees to supply gas at the rate of $1.85 per 1,000 cubic feet for the first seven years, at $1.50 for the next eight years, and at $1.25 per 1,000 for the remaining 15 years.

SUPT. D. W. CRAFTS, of the Northampton (Mass.) Gas Company, it is said, recommends the use of spent lime for decimating the ranks of the army worm and pests of kindred type.

AT the annual meeting of the Peoples Gas Light Company, of Rutland, Vt., the following Directors were elected: W. B. Mussey, J. W. Cramton, E. E. Keyes, S. M. Wilson, E. C. Lewis and G. H. Verder.

THE Directors of the Savannah (Ga.) Gas Light Company have declared a dividend of 3 per cent., payable on demand.

THE Directors of the Newton and Watertown (Mass.) Gas Light Company have announced a reduction in the selling rate, the same to go into effect October 1st. Under the new schedule the gross price is put at $1.50, and prompt payment (within 20 days) entitles the user to a rebate of 15 cents per 1,000.

AT the annual meeting of the Consolidated Gas Company, of Baltimore, Md., the officers chosen were: Directors, E. C. Benedict, E. Austin Jenkins, Wm. F. Burns, Bernard Cahn, John E. Hurst, G. A. von Lingen, W. F. Frick, James A. Gary, John W. Hall, Henry James, D. D. Mallory and William Wallace Spence; President, John W. Hall—his 17th consecutive term; Vice-President, James A. Gary; Secretary, N. T. Meginnis; Treasurer, Joseph W. Clarke.

MR. DUSENBERRY, General Manager of the East Newark (N. J.) Gas Light Company, appeared before the Hudson county Board of Equalization of Taxes some days ago, for the purpose of discussing with the Board the question of assessing the gas mains in Harrison, Kearney and East Newark, owned by the Gas Company. The Board recently instructed the assessors of the named towns to assess the mains of the Company for purposes of taxation, and the Company denied the right of the Board to make such assessment. The result of the argument was that the assessment of the mains of the Company was arranged on the following basis: In Harrison, $9,182.28; in Kearney, $7,643.68; in East Newark, $13,262.47.

MR. JOHN W. LANEHART, a trusted lieutenant of Governor Altgeld, of Illinois, and one of the originators of the Ogden Gas Company, of Chicago, died on the morning of the 16th inst. Deceased, who was in his 39th year, was born in Belleville, O., and received his education in the Oberlin (O.) University and in Dartmouth College, from which latter named institution he graduated with marked honor.

THE contract for bench work on the gas plant at the U. S. Military Academy, West Point, N. Y., bids for which were opened on the 7th inst., has been awarded to the Brooklyn Firebrick Works.

THE annual meeting of the Milford (Mass.) Gas Light Company was well attended, and the reports of the officers showed that the Company's business for the past twelvemonth was transacted at a fair profit. The officers elected were: Directors, C. F. Claflin, B. E. Harris, J. B. Bancroft, C. L. Wires, George A. Draper, N. B. Johnson, F. J. Dutcher, I. N. Davis, L. H. Cook and Jas. E. Walker; President, C. F. Claflin; Secretary, L. H. Cook; Treasurer, B. E. Harris; Auditor, C. A. Cook.

"OBSERVER" forwards the following: "The Chelsea (Mass.) Gas Light Company has voluntarily reduced the price of gas, which action was taken at the semi-annual meeting held early this month. Heretofore the price was $1.90 per 1,000 cubic feet, with a discount of 20 cents per 1,000 in case of prompt payment. Beginning with July 1st, the rate is put at $1.70 per 1,000 cubic feet, with a discount of 20 cents per 1,000 on all bills settled within 15 days. This reduction is a purely voluntary one, the concession made about two years ago having been granted on the recommendation of the Board of Gas and Electric Light Commissioners.

THE dividends on gas stocks, disbursed in San Francisco during the month of June, amounted to $76,833. During the corresponding month in 1895 the returns to shareholders amounted to $75,333.

MR. HOLMES, of the Santa Ana (Cal.) Gas and Electric Company, admits that the electric lighting branch of the Company's trade is operated at a loss.

THE above mention leads to the remark that the special election held at Santa Ana recently, for the purposes of determining whether or not the city should issue bonds for the construction of a municipal electric lighting plant, resulted in the rejection of the proposition.

A CORRESPONDENT forwards the following: "If Superintendent Dirvin, of the Healdsburg (Cal.) gas works had spent the Fourth of July out-of-town, as many did, the establishment he is operating to day might have been a mass of ruins. The section hands on the railroad had set fire to the dry grass on the sides of the track, when the pool of drainage from the gas house, which had accumulated for years, and which consisted largely of tar, ignited and burned like powder. The flames threatened the gas works, but Mr. Dirvin was on hand promptly, and by well-directed effort the danger was averted."

THE Loan Bill, under which several millions of dollars for public improvements in Philadelphia are to be raised, has been signed by Mayor Warwick. Under the bill, the sum of $1,000,000 is to be set aside for the improvement of the gas works. The Director of Public Works (Mr. Thompson) says that the betterment of the gas plant will be begun as soon as possible; for, he remarks, "We have in our city 263,500 houses and only 161, 245 meters, which shows that only about two-thirds of the houses in Philadelphia are supplied with gas; and these consumers of gas are to-day paying for all the public lighting, amounting to $700,000, and are also paying a profit into the Treasury of the city. The permanent improvements made since the city secured control of the gas works have been very limited, and we have the same system in vogue to-day that has been in force for years. We are not in touch with the progress of the times, and in comparison our works are not up to the standard of those of our sister cities. We can, by the expenditure of $100,000, equip our works with charging and discharging machines, coal breakers and conveyers, which I am informed by Chief Park would effect an annual saving to the city of $200,000 to $250,000. The annual

(*Continued on page* 135.)

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(*Continued from page* 134.)

report of Chief Park stated that the unaccounted-for gas and leakage amounted to 20 per cent. of the production; and, as the receipts in 1895 were over $3,000,000, this unaccounted-for gas amounts to nearly $600,000. This increasing percentage or unaccounted-for gas each year is due to the insufficient size of many of the distributing mains, which are extended in length from year to year, as the growth of the city makes it necessary to supply gas in new territories; to force the gas through the small mains and reach these extreme distances requires greater pressure at the works or holder station. The pressure carried at our works to-day in order to supply gas to some sections of the city is unprecedented in the history of gas making, and the great pressure that we are compelled to carry increases condensation in the mains, and in many cases forces leakage at points which probably would not leak under less pressure. The gas manufactured by the Philadelphia gas works is of as good, if not better, quality than that made in any other gas works in the United States; but when we are compelled to force gas by great pressure through the many miles of small-sized or inadequate mains, the candle power will necessarily be reduced by reason of the excessive friction to which the gas is subjected, thereby robbing it of some of those hydrocarbons which are the source of its illuminating quality—hence the complaint of poor gas. The fault is not in the manufacture but in the system of distribution. The condition of our gas plant to-day implies that the mains should be sufficiently increased in size so as to pass freely the volume of gas required by any section of the city with the least pressure at the works or holder station, and the minimum percentage charged to leakage will only be obtained when mains are of adequate size to deliver the quantity of gas required with the least possible resistance at the lowest pressure. Small and insufficient mains are responsible for the unsatisfactory quality of gas furnished our citizens, and this will be remedied as far as possible by the money in the loan for the purpose."

Influence of Acetylene on Coal Consumption.

Dr. Frank, of Charlottenburg, in speculating on the topic named in the heading, says, when it is considered that our coal fields are not inexhaustible, the influence likely to be exerted on coal consumption by acetylene gas constitutes a subject of considerable interest. If it be admitted that 10 tons of gas coal generate 2,800 cubic meters (38,886 cubic feet) of lighting gas, only one-third that quantity of coal would be required to produce a ton of carbide, or 3,000 cubic meters (105,949 cubic feet) of acetylene gas, having a considerably higher illuminating power than an equal quantity of ordinary lighting gas. The above figures are based upon the estimate of 2,400-horse power per hour being required to produce a ton of carbide, which is now sold at 400 francs ($80) per ton; but there is every reason to suppose that this price, as well as the amount of motive power, and consequently of coal, required for the production of this substance will soon be considerably reduced. Opinions vary greatly, however, as to the yield of carbide in acetylene gas, from 225 to 350 cubic meters) mean 10,135 cubic feet) per ton being given by different authorities. Dr. Frank concludes that, although nothing definite can be predicted at present as to the final result of the struggle for supremacy by lighting gas, electricity and acetylene, the chances are not at all unfavorable to the last named substance.

The Market for Gas Securities.

The slump and unevenness in the general share market continued during the week, with the result that some phenomenally low prices were made. Consolidated sold down to 140, on comparatively light trading, and subsequently rallied fairly, the opening to-day (Friday) being reported at 146½ bid. We know full well that it must be rather tiresome to our readers to have put before them consistent and repeated advice to buy on a falling market, but the cold facts are that if Consolidated gas was worth on July 29th, 1895, 140 to 140¼ (such is the quotation in the JOURNAL for that date), to-day it is worth intrinsically, beyond the possibility of a doubt, 175. The business the Company is doing goes on steadily increasing, and plant betterments are kept right up to the mark. Equitable is offered at 198 and Mutual shows no change. The other marked feature in the city gas share market is the weakness in New York and East River common, which is bid for at 27 and offered at 30. In our belief the stock is a decided purchase at anything under 35; but, as said before, such advice looks unsound in face of the prevailing distrust of everything.

Brooklyn Union, at 81 to 85, is certainly tempting. Our remark of a week ago that it is easily worth par is repeated with emphasis. Chicago gas came in this morning at 52 to 52¼, and we can report as an absolute fact the steady absorption of these shares, on the breaks, by the people who are, and have been of late, the most heavily interested in it. Baltimore Consolidated is weak, and lower, at 59 to 59½. Bay State is utterly neglected and Lacledes are weak. In fact, as everybody knows, weakness is the rule; but it is an unreasoning weakness that prevails.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

JULY 27.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	146½	147
Central	500,000	50	150	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	..	198
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	225	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
Northern	150.000	50	79	80½
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	27	30
Preferred	2,000,000	100	..	70
Bonds 1st 5's	3,500,000	1,000	96	99
" 1st Con. 5's	1,500,000	..	..	88
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	75	76
Preferred	5,000,000	100	162	106
Bonds, 1st Mortgage, 5's	1,500,000	1,000	109	112
Yonkers	299,650	50	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	81	85
" " Bonds (5's)	15,000,000	1,000	102½	..
Bay State	5,000,000	50	17	18
" Income Bonds	2,000,000	1,000	30	32
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	..	79
2d " " "	3,000,000	1,000	61	63
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	52	52¼
Chicago Gas Lt. & Coke Co.				
Guaranteed Gold Bonds.	7,650,000	1,000	94	94¼
Columbus	1,069,000	..	..	65
1st Mortgage	1,085,000	..	..	96
Consumers. Jersey City	2,000,000	100	..	78
" Bonds	600,000	1,000	..	101
Cincinnati G. & C. Co.	7,000,000	100	196¾	197
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	41
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	59	59½
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	32	33
" Con. Bonds	4,312,000	..	..	82
Equitable Gas & Fuel Co.,				
Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	80	90
" Bonds	2,000,000	.	..	93
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	..	135
" Bonds, 6's	2,650,000	..	..	104
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	..	92½
Bonds	1,000,000	1,000	87	90
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	18¾	18½
Preferred	2,500,000	100	..	80
Bonds	9,084,400	1,000	91½	93½
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	93	98
Bonds, 6's	4,000,000	.	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	52	53¼
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co.,				
Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	83	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	93¾	95
St. Paul Gas Light Co.	1,500,000	100	67½	70
1st Mortgage, 6's.	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500,000	25	..	..
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	60	65
Bonds, 5's	3,556,000	.	85	90
Wilmington, Del.	500,000	5	188	190

Advertisers' Index.

GAS ENGINEERS.

	Page
Jos. R. Thomas, New York City	157
Wm. Henry White, New York City	155
Fred. Bredel, Milwaukee, Wis	140
H. C. Slaney, Brooklyn, N. Y	155
Geo. R. Rowland, New York City	155
The Western Gas Construction Co., Fort Wayne, Ind	146
Humphreys & Glasgow, New York City	142
T. G. Lansden, St. Louis, Mo	155
American Gas Co., Phila., Pa	140
David Leavitt Hough, New York City	157

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md	153
United Gas Improvement Co., Phila., Pa	145
Burdett Loomis, Hartford, Conn	144
National Gas and Water Co., Chicago, Ills	147
Economical Gas Apparatus Construct'n Co.,Toronto,Ont.	153
The Western Gas Construction Co., Fort Wayne, Ind	146

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City	156
Continental Iron Works, Brooklyn, N. Y	154
Deily & Fowler, Phila., Pa	156
Kerr Murray Mfg. Co., Fort Wayne, Ind	152
Stacey Mfg. Co., Cincinnati, Ohio	155
Bartlett, Hayward & Co., Baltimore, Md	153
Davis and Farnum Mfg. Co., Waltham, Mass	152
R. D. Wood & Co., Phila., Pa	154
Isbell-Porter Company, New York City	154
Fred. Bredel, Milwaukee, Wis	140
United Gas Improvement Co., Phila., Pa	145
Berlin Iron Bridge Co., East Berlin, Conn	142
National Gas and Water Co., Chicago, Ills	147
Economical Gas Apparatus Construct'n Co.,Toronto, Ont.	153
The Western Gas Construction Co., Fort Wayne, Ind	146
Humphreys & Glasgow, New York City	142
Gas Engineering Co., Pittsburgh, Pa	152
American Gas Co., Phila., Pa	140

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City	155
R. D. Wood & Co., Phila., Pa	154
James R. Floyd & Sons, New York City	156
Continental Iron Works, Brooklyn, N. Y	154
Gas Engineering Co., Pittsburgh, Pa	152

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md	153
Fred. Bredel, Milwaukee, Wis	140
J. H. Gautier & Co., Jersey City, N. J	150
Parker-Russell Mining and Mfg. Co., St. Louis, Mo	150
Adam Weber, New York City	150

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons, New York City	155

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich	137
G. Shepard Page's Sons, New York City	155
Gas Engineering Co., Pittsburgh, Pa	152

GAS METERS.

John J. Griffin & Co., Phila., Pa	160
American Meter Co., New York and Philadelphia	157
The Goodwin Meter Co., Phila., Pa	154
Helme & McIlhenny, Phila., Pa	159
D. McDonald & Co., Albany, N.Y	159
Nathaniel Tufts, Boston, Mass	158
Maryland Meter and Mfg. Co. Baltimore, Md	158
Metric Metal Co., Erie, Pa	158
Keystone Meter Co., Royersford, Pa	141
Buhl Stamping Company, Detroit, Mich	159

PREPAYMENT METERS.

American Meter Co.. New York and Philadelphia	159
John J. Griffin & Co., Phila., Pa	160
D. McDonald & Co., Albany, N. Y	159

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio	157
M. J. Drummond, New York City	157
R. D. Wood & Co., Phila., Pa	154
Warren Foundry and Machine Co., New York City	157
Donaldson Iron Co., Emaus, Pa	157
Addyston Pipe and Steel Co., Cincinnati, O	157

PIPE CUTTERS.

Wm. Anderson, East Boston, Mass	137

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, New York City	147

GAS COALS.

Penn Gas Coal Co., Phila., Pa	149
Perkins & Co., New York City	148
Despard Gas Coal Co., Baltimore, Md	149
Westmoreland Coal Co., Phila., Pa	149
Berwind-White Coal Mining Co., New York and Phila	148

CANNEL COALS.

Perkins & Co., New York City	148
Macfarlane & Co., Louisville, Ky	137

GAS ENRICHERS.

Standard Oil Co., New York City	149
The Sun Oil Co., Pittsburgh, Pa	149

COKE CRUSHER.

C. M. Keller, Columbus, Ind	149

CONVEYING MACHINERY.

C. W. Hunt Company, N. Y. City	137

GAS GAUGES.

The Bristol Co., Waterbury, Conn	137

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City	147
Isbell-Porter Co., New York City	154
The Wilder Mfg. Co. Phila., Pa	138

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Company, New York City	154
Continental Iron Works, Brooklyn, N. Y	154
G. Shepard Page's Sons, New York City	155

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J	150
B. Kreischer & Sons, New York City	150
Adam Weber, New York City	150
Laclede Firebrick Mfg. Co., St. Louis, Mo	150
Cyrus Borgner, Phila., Pa	150
James Gardner, Jr., Pittsburgh, Pa	150
Henry Maurer & Son, New York City	150
Baltimore Retort and Firebrick Co., Baltimore, Md	150
Parker-Russell Mining and Mfg. Co., St. Louis, Mo	150
Brooklyn Firebrick Works, Brooklyn, N. Y	150

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N. Y	150

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa	139

MICA GOODS.

The Mica Mfg. Co., New York City	137

BURNERS.

C. A. Gefrorer, Phila., Pa	154

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn	137

GAS TUBING.

Wm. M. Crane & Co., New York City	138

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City	147
Greenpoint Chemical Works, Brooklyn, N. Y	147
Henry W. Douglas, Ann Arbor, Mich	147

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind	144
Isbell-Porter Company, New York City	154
Connelly Iron Sponge and Governor Co., New York City	147

VALVES.

Ludlow Valve Manufacturing Co., Troy, N.Y	146
Chapman Valve Manufacturing Co., Boston, Mass	146
R. D. Wood & Co., Phila., Pa	154
Continental Iron Works, Brooklyn, N. Y	154
The P. H. & F. M. Roots Co., Connersville, Ind	144
Isbell-Porter Co., New York City	154
The Western Gas Construction Co., Fort Wayne, Ind	146

ELECTRICAL APPARATUS.

Wm. Henry White, New York City	155

GAS ENGINES.

Otto Gas Engine Works, Phila., Pa	120
The American Gas Engine Co., Phila., Pa	151
Backus Water Motor Co., Newark, N. J	97

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City	137
W. G. & G. Greenfield, East Newark, N. J	137

PURIFIER SCREENS.

John Cabot, New York City	137

GAS STOVES.

American Meter Co., New York and Philadelphia	143
The Goodwin Meter Co., Phila., Pa	158
George M. Clark & Co., Chicago, Ills	141
Maryland Meter and Manufacturing Co., Baltimore, Md.	158
William M. Crane & Co., New York City	138
Keystone Meter Co., Royersford, Pa	141
A. Weiskittel & Son, Baltimore, Md	61

CHINA GAS KILNS.

William M. Crane & Co., New York City	138

GASHOLDER PAINT.

New York Marine Paint Co., Poughkeepsie, N.Y	146

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y	146

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md	153
Continental Iron Works, Brooklyn, N. Y	154
Deily & Fowler, Philadelphia, Pa	156
Davis & Farnum Mfg. Co.,Waltham, Mass	152
Kerr Murray Mfg. Co., Fort Wayne, Ind	152
Stacey Mfg. Co., Cincinnati, Ohio	155
R. D. Wood & Co., Philadelphia, Pa	154

BOOKS, ETC.

Scientific Books	156
Field's Analysis	148
Digest of Gas Cases	149
Directory of Gas Companies	157
Practical Photometry	150
Coal Tar Genealogical Tree	148
Management of Small Gas Works	142
Handbook on Gas Engines	157
Gas Flow Computers	138

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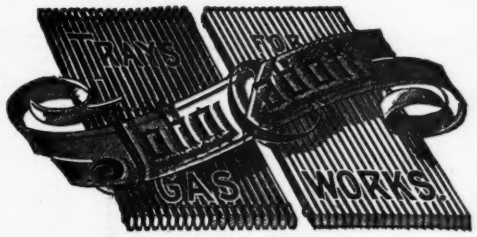

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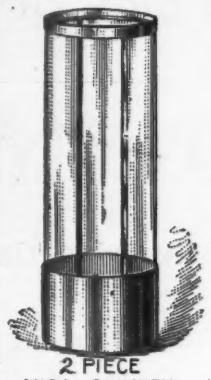

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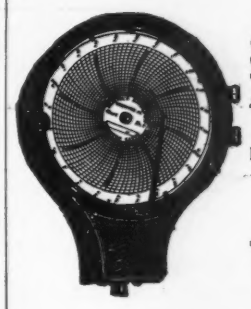

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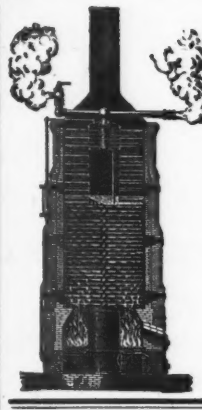

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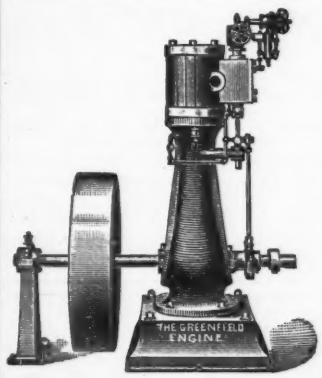

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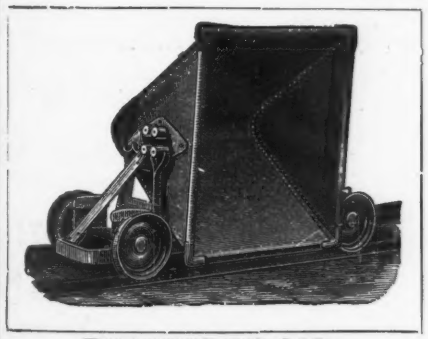

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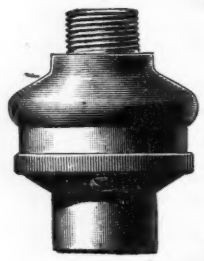

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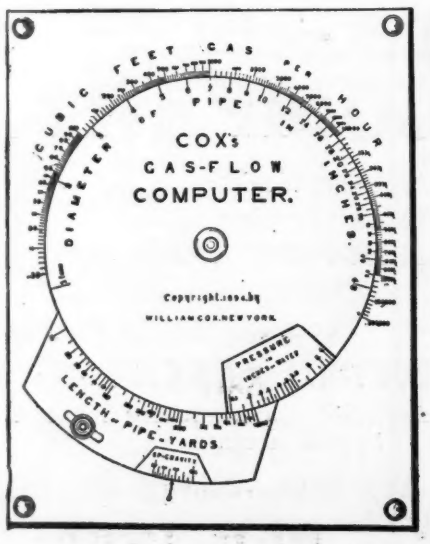

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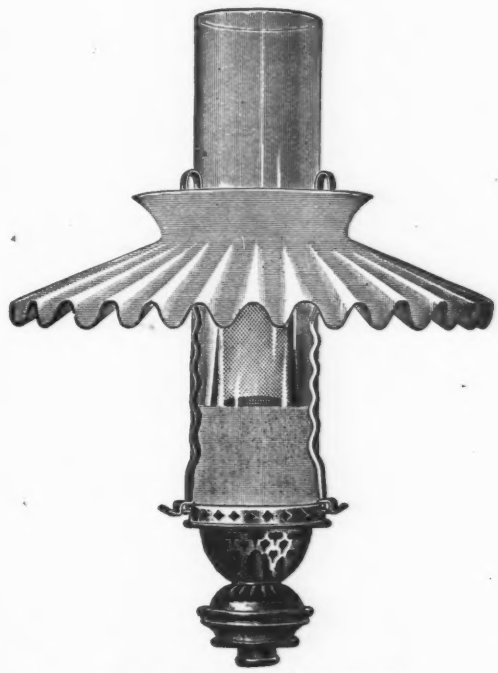

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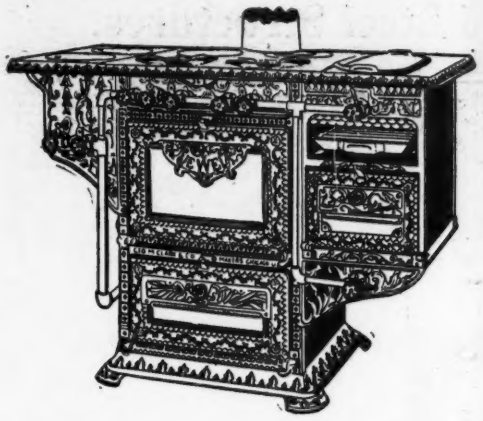

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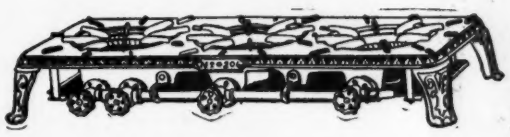

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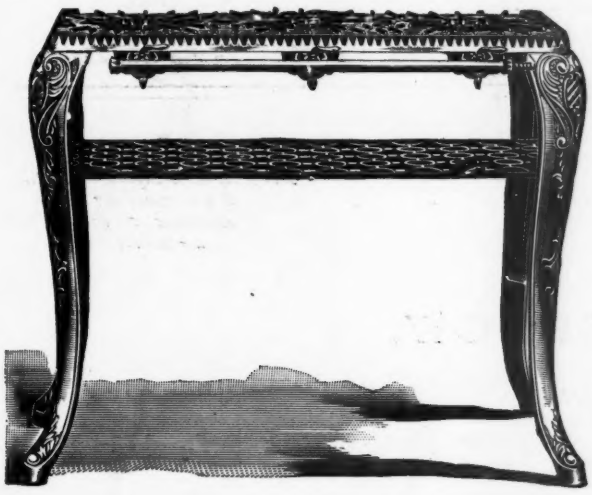

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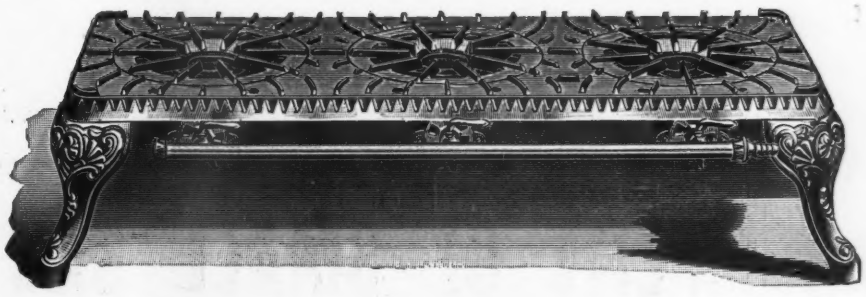

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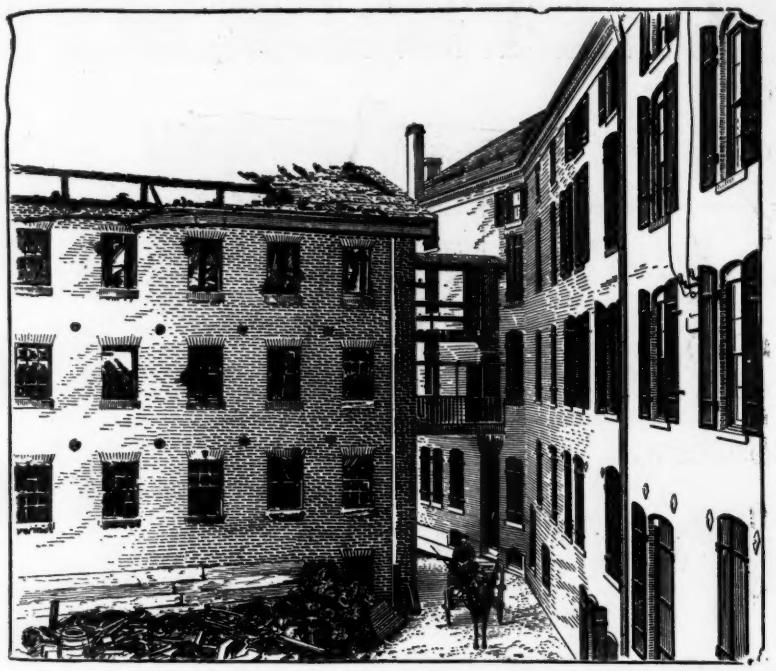

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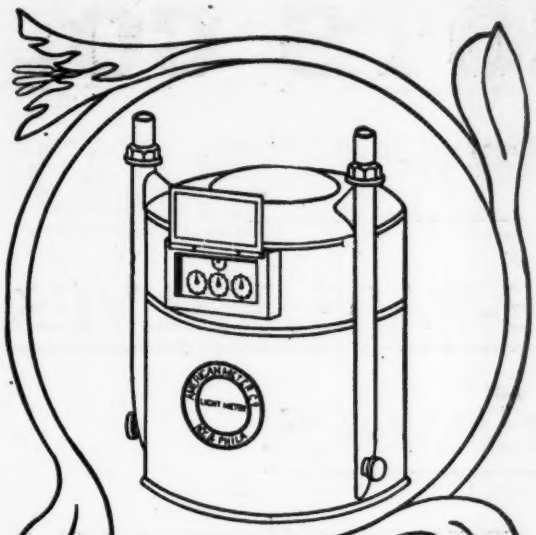

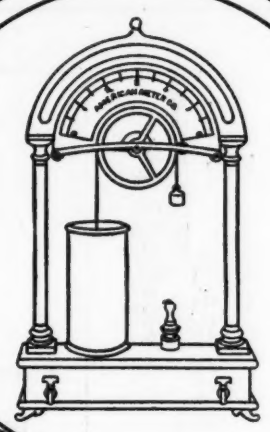

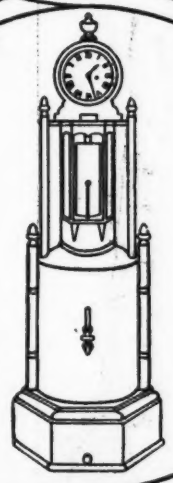

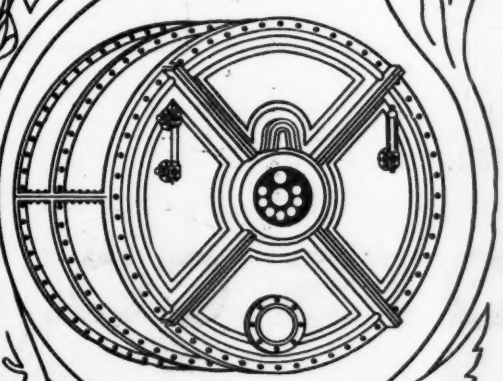

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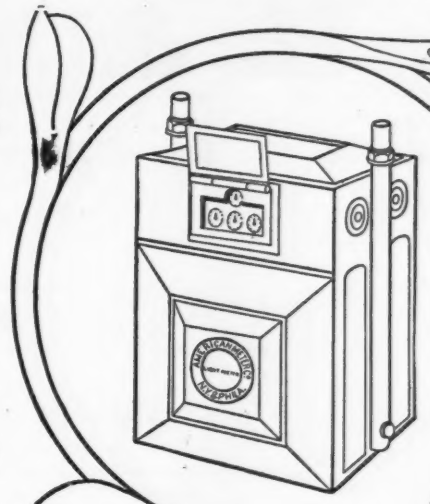
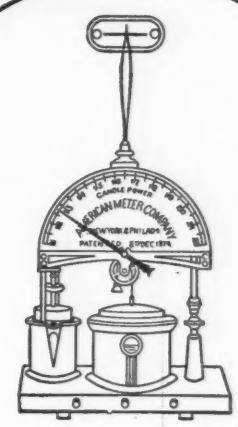
AUGUST, 1896.

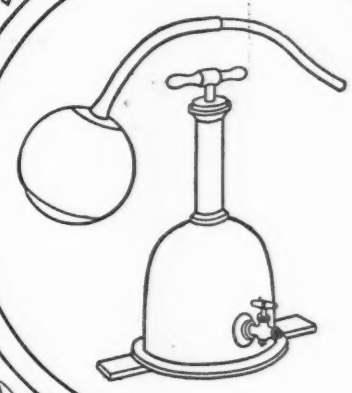
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sat.	1	7.50 PM LQ	11.40 PM	7.10	3.30
Sun.	2	7.40	12.10 AM	7.10	3.30
Mon.	3	7.40	12.50	7.10	3.30
Tue.	4	7.40	1.50	7.10	3.30
Wed.	5	7.40	4.00	7.10	3.30
Thu.	6	7.40	4.00	7.10	3.45
Fri.	7	7.40	4.00	7.10	3.45
Sat.	8	7.40 NM	4.00	7.10	3.45
Sun.	9	7.30	4.10	7.10	3.45
Mon.	10	7.30	4.10	7.10	3.45
Tue.	11	7.30	4.10	7.10	3.45
Wed.	12	7.30	4.10	7.10	3.45
Thu.	13	8.10	4.10	6.55	4.00
Fri.	14	8.40	4.10	6.55	4.00
Sat.	15	9.20 FQ	4.10	6.55	4.00
Sun.	16	10.10	4.20	6.55	4.00
Mon.	17	11.00	4.20	6.55	4.00
Tue.	18	12.10 AM	4.20	6.55	4.00
Wed.	19	1.10	4.20	6.55	4.00
Thu.	20	2.20	4.20	6.45	4.10
Fri.	21	No L.	No L	6.45	4.10
Sat.	22	No L. FM	No L.	6.45	4.10
Sun.	23	No L.	No L.	6.45	4.10
Mon.	24	7.10 PM	8.10 PM	6.45	4.10
Tue.	25	7.10	8.30	6.45	4.10
Wed.	26	7.10	8.50	6.45	4.10
Thu.	27	7.10	9.20	6.30	4.20
Fri.	28	7.10	9.40	6.30	4.20
Sat.	29	7.10	10.10	6.30	4.20
Sun.	30	7.00 LQ	10.50	6.30	4.20
Mon.	31	7.00	11.30	6.30	4.20

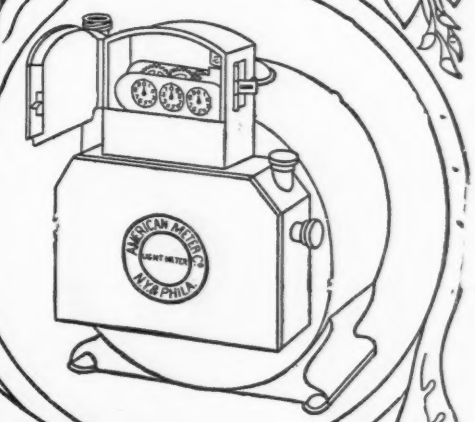
TOTAL HOURS LIGHTING DURING 1896.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.40	January	423.20
February	207.00	February	367.40
March	193.00	March	355.35
April	174.10	April	298.50
May	164.00	May	264.50
June	142.10	June	234.25
July	142.10	July	243.45
August	150.50	August	280.25
September	163.00	September	321.15
October	193.10	October	374.30
November	207.00	November	401.40
December	237.30	December	433.45
Total, yr.	2194.40	Total, yr.	4000.00









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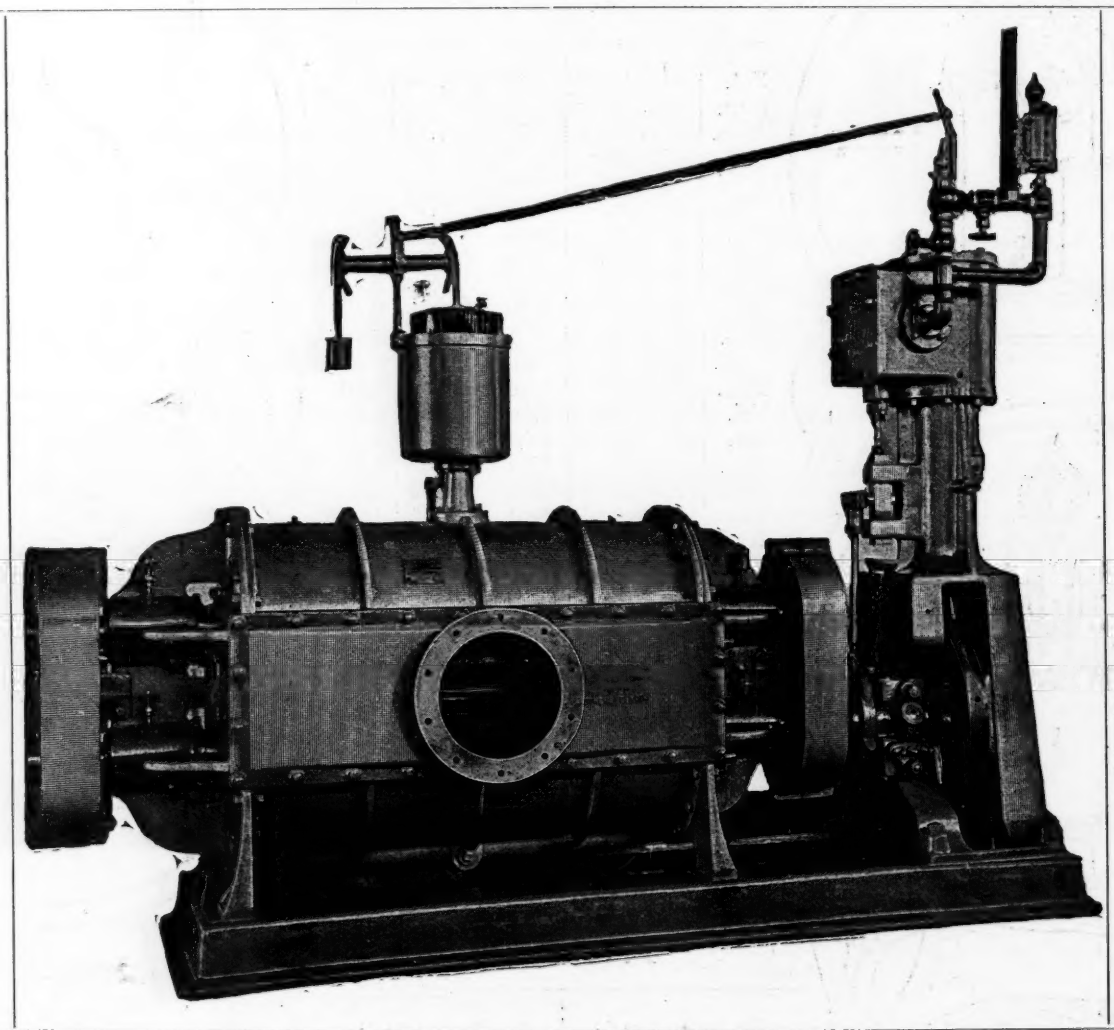

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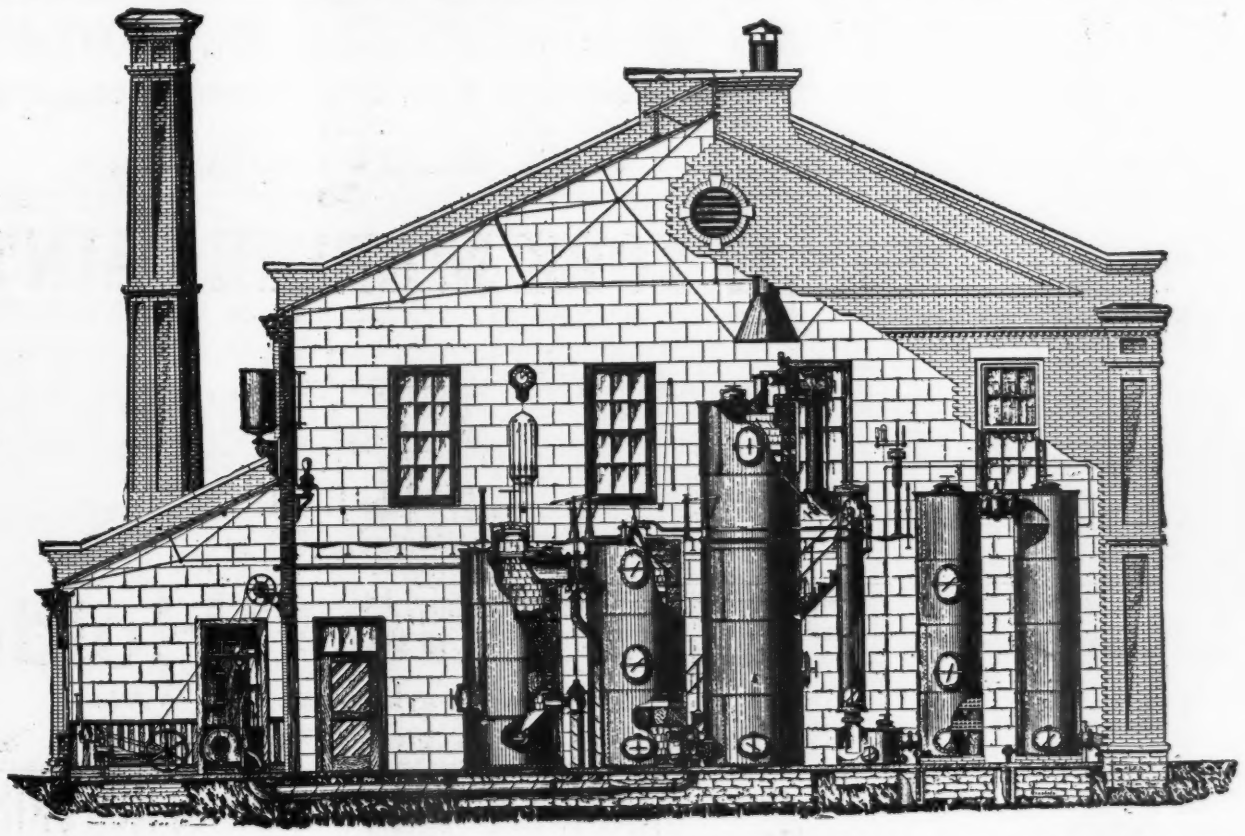

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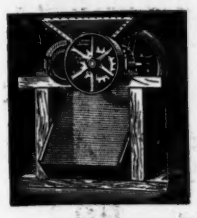

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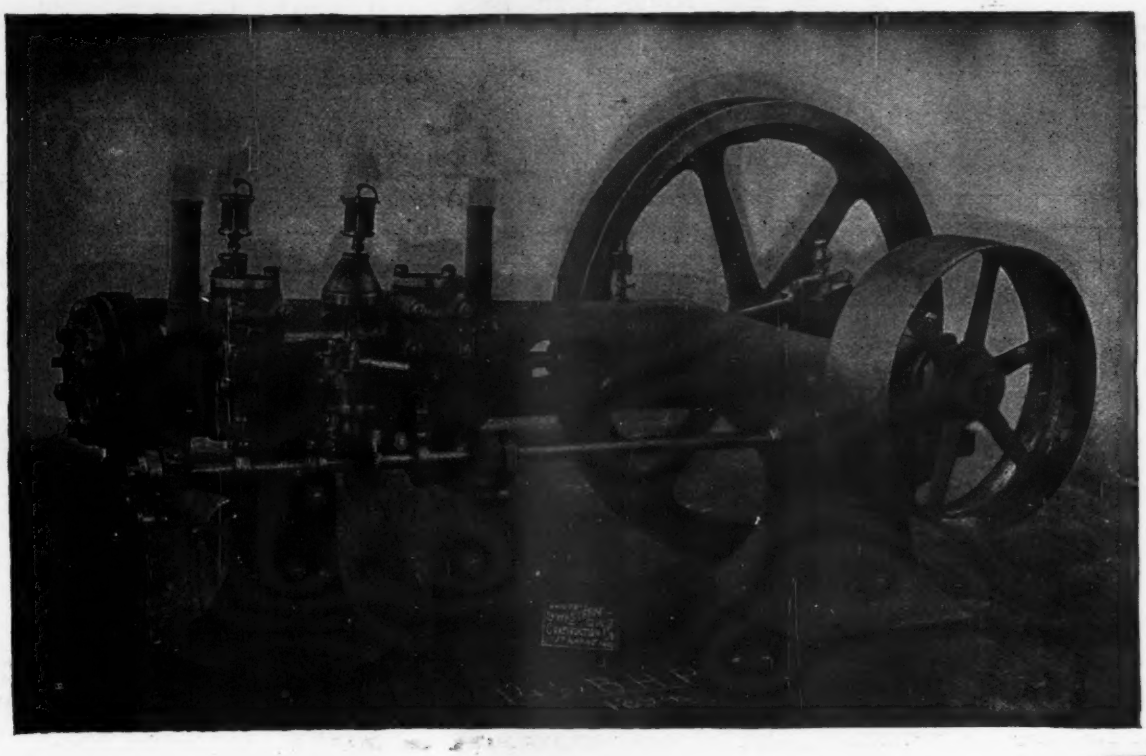

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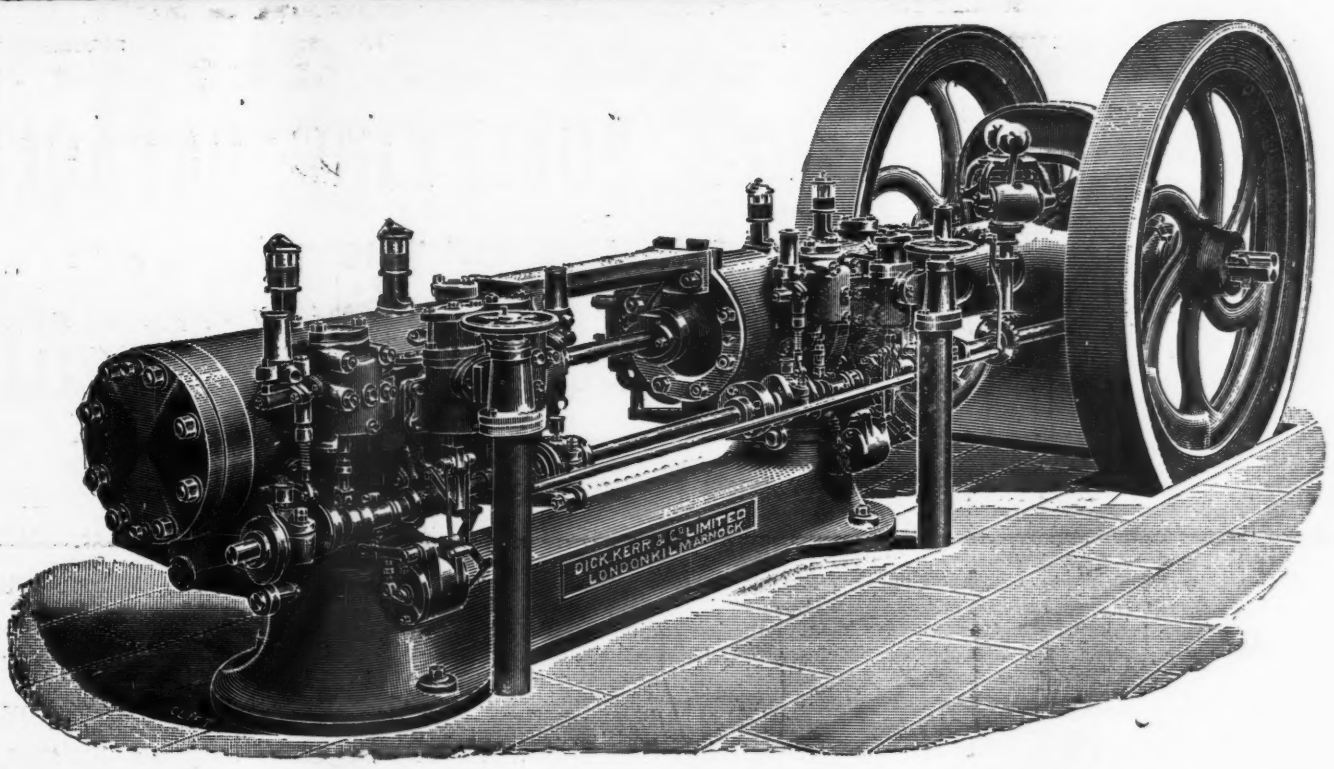

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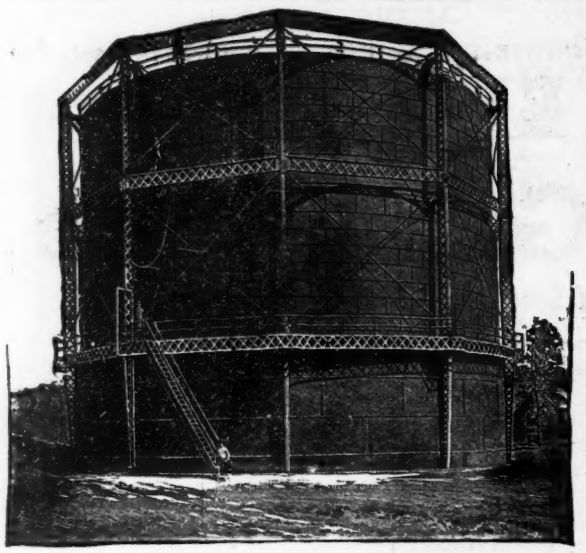

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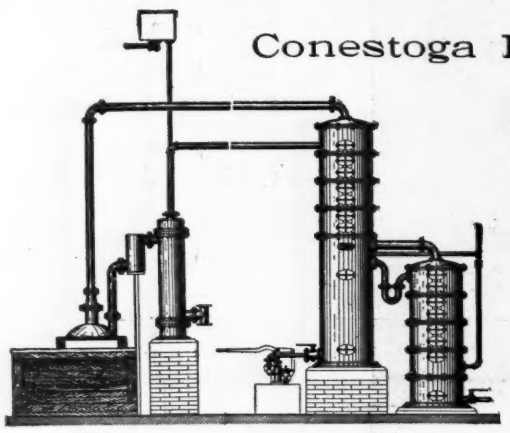

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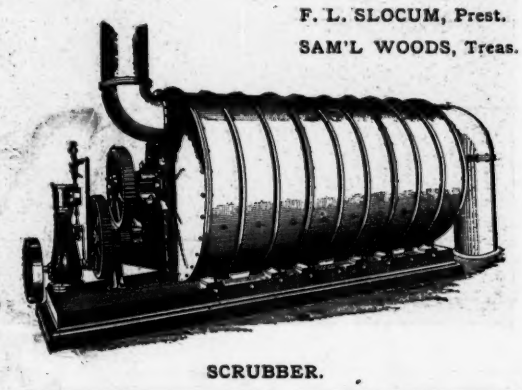

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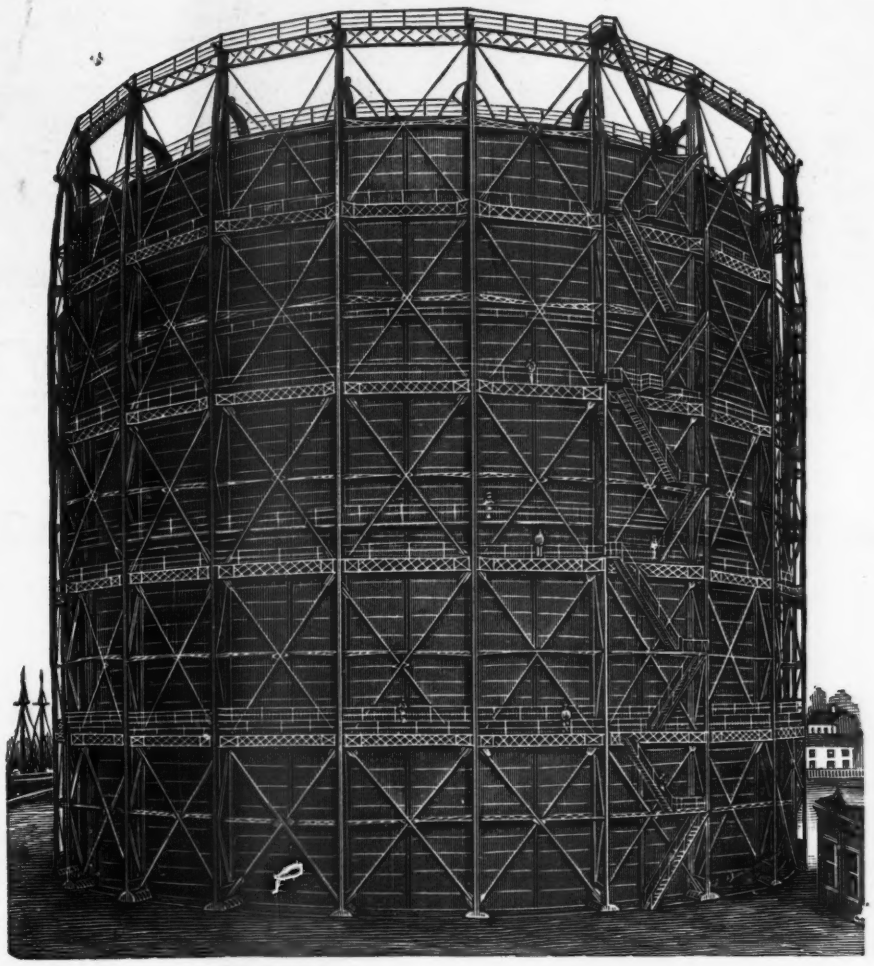

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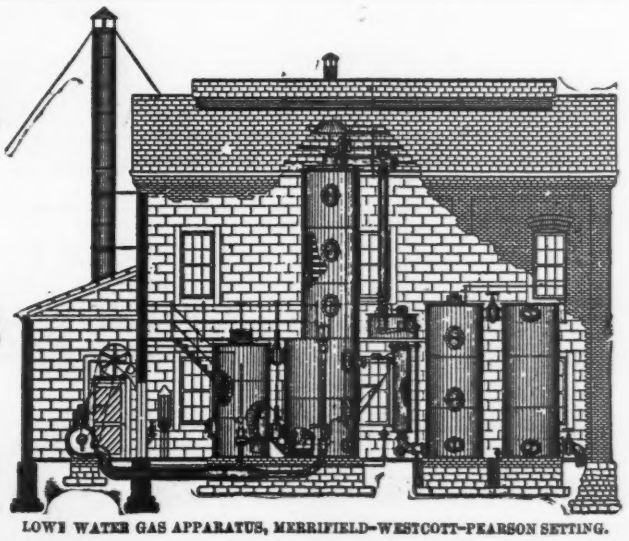

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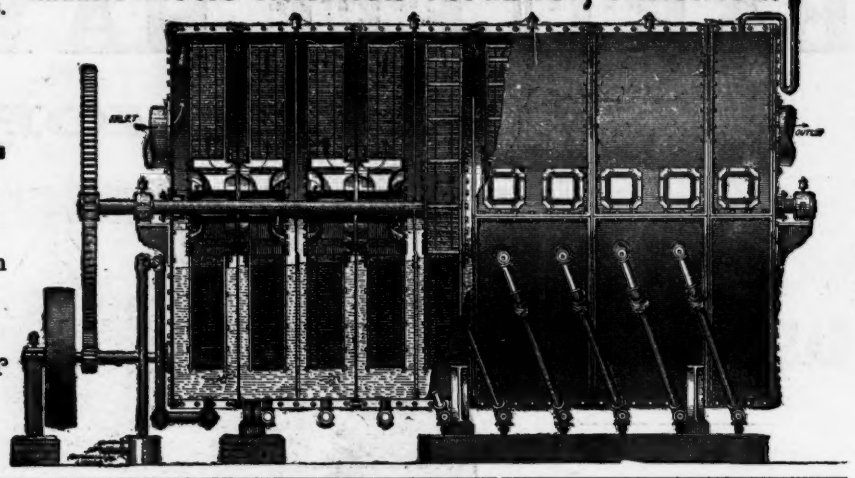

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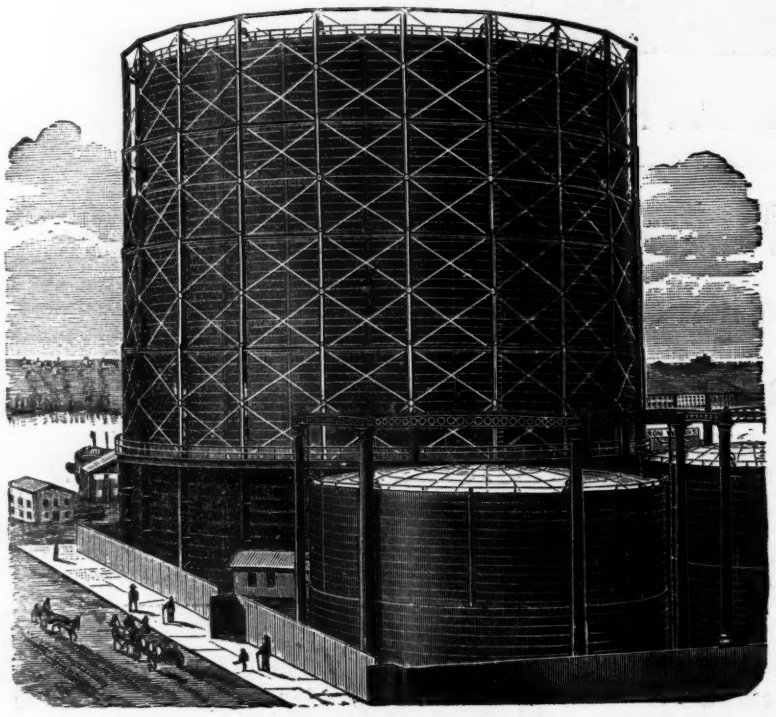

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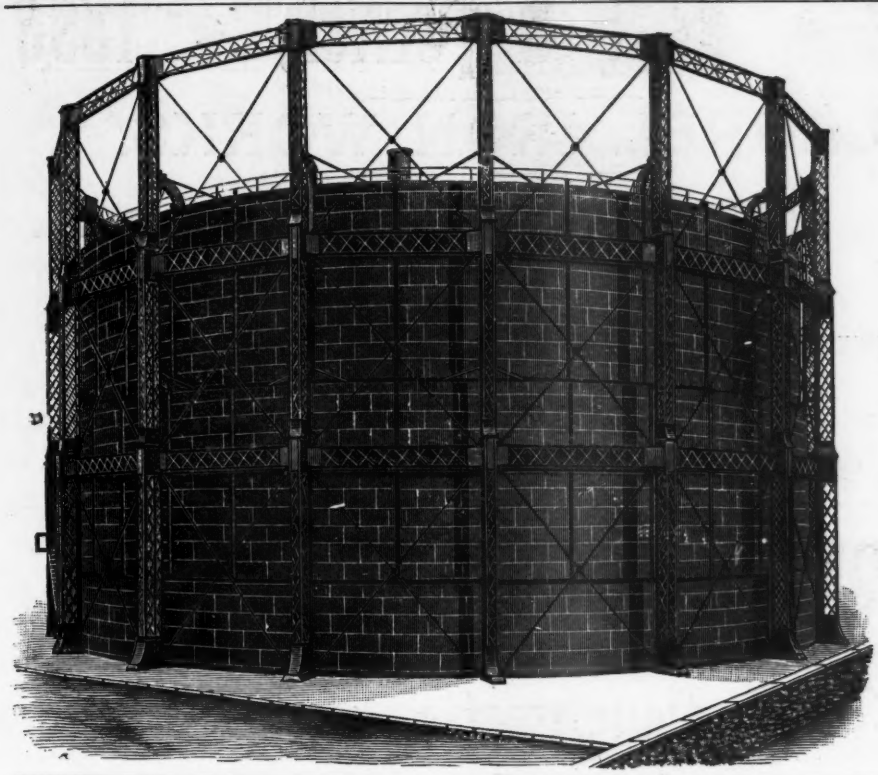

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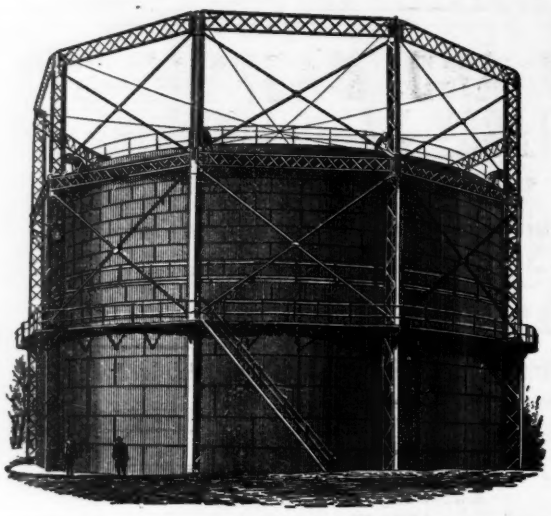

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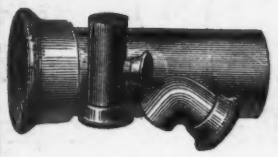

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